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Abstract

The 2015 series of RIO Country Reports analyse and assess the policy and the national research and innovation system developments in relation to national policy priorities and the EU policy agenda with special focus on ERA and Innovation Union. The executive summaries of these reports put forward the main challenges of the research and innovation systems.

Table of Contents

Foreword	4
Acknowledgments	5
Executive summary	6
1. Overview of the R&I system	12
1.1 Introduction	12
1.2 Structure of the national R&I system and its governance	14
1.2.1 Main features of the R&I system.....	14
1.2.2 Governance.....	16
1.2.3 Research performers	18
2. Recent Developments in Research and Innovation Policy and systems	20
2.1 National R&I strategy	20
2.2 R&I policy initiatives	24
2.2.1 Evaluations, consultations, foresight exercises.....	28
2.3 European Semester 2014 and 2015	30
2.4 National and Regional R&I Strategies on Smart Specialisation.....	31
2.5 Main policy changes in the last five years	33
3. Public and private funding of R&I and expenditure	35
3.1 Introduction	35
3.2 Smart fiscal consolidation.....	36
3.2.1 Economic Growth, fiscal context and public R&D	36
3.2.2 Direct Funding of R&D activities	38
3.2.3 Indirect funding - tax incentives and foregone tax revenues	41
3.2.4 Fiscal consolidation and R&D.....	42
3.3 Funding flows	43
3.3.1 Research funders	43
3.3.2 Funding sources and funding flows	44
3.4 Public funding for public R&I	46
3.4.1 Project vs. institutional allocation of public funding	46
3.4.2 Institutional funding	47
3.4.3 Project funding	49
3.4.4 Other allocation mechanisms	50
3.5 Public funding for private R&D	50
3.5.1 Direct funding for private R&I	50
3.5.2 Indirect financial support for private R&I	55
3.6 Business R&D	58
3.6.1 The development in business R&D intensity	58
3.6.2 The development in business R&D intensity by sector.....	59
3.6.3 The development in business R&D intensity and value added.....	61
3.7 Assessment.....	64
4. Quality of science base and priorities of the European Research Area	66

4.1	Quality of the science base	66
4.2	Optimal transnational co-operation and competition	67
4.2.1	Joint programming, research agendas and calls	67
4.2.2	RI roadmaps and ESFRI	68
4.3	International cooperation with third countries.....	69
4.4	An open labour market for researchers.....	70
4.4.1	Introduction	70
4.4.2	Open, transparent and merit-based recruitment of researchers.....	71
4.4.3	Access to and portability of grants	72
4.4.4	Doctoral training	73
4.4.5	Gender equality and gender mainstreaming in research	73
4.5	Optimal circulation and Open Access to scientific knowledge.....	74
4.5.1	e-Infrastructures and researchers electronic identity	74
4.5.2	Open Access to publications and data.....	74
5.	Framework conditions for R&I and Science-Business cooperation	76
5.1	General policy environment for business.....	76
5.2	Young innovative companies and start-ups	77
5.3	Entrepreneurship skills and STEM policy	78
5.4	Access to finance	79
5.5	R&D related FDI.....	80
5.6	Knowledge markets	81
5.7	Knowledge transfer and open innovation	82
5.7.1	Indicators Funding	82
5.7.2	Policy Measures	88
5.8	Regulation and innovation	93
5.9	Assessment of the framework conditions for business R&I.....	93
6.	Conclusions.....	95
6.1	Structural challenges of the national R&I system	95
6.2	Meeting structural challenges.....	97
	References	100
	Abbreviations	104
	List of Figures.....	106
	List of Tables	107
	Annex 1 – List of the main research performers.....	108
	Annex 2 – List of the main funding programmes	109
	Annex 3 – Evaluations, consultations, foresight exercises.....	111

Foreword

The report offers an analysis of the R&I system in The Netherlands for 2015, including relevant policies and funding, with particular focus on topics critical for EU policies. The report identifies the main challenges of the Dutch research and innovation system and assesses the policy response. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites etc. The quantitative data is, whenever possible, comparable across all EU Member State reports. Unless specifically referenced all data used in this report are based on Eurostat statistics available in February 2016. The report contents are partly based on the RIO country report, 2014 (Jansen & Den Hertog, 2015).

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Executive summary

After facing three recessions since 2008, the Dutch economy finally started to show signs of recovery in 2014.¹ Dutch GDP per capita is well above EU28 average of €27,300 (2014): in 2012-2014 it grew from €38500 to €39,300.

According to the Innovation Union Scoreboard 2015, the Netherlands is leading among the group of 'innovation followers'. One of the key strengths of the Dutch innovation systems lies in the quality of its science base, as reflected in the number and quality of scientific publications. Dutch research universities do well in international rankings. Relative to the size of its population the Netherlands receives the highest number of ERC grants of EU MS. While improving the science base is not one of the challenges highlighted in this paper, the threat exists that The Netherlands will not be able to maintain this strong performance in the light of planned funding cuts for basic research.

In the years following the crisis, public expenditures on R&D have been relatively safeguarded. During the crisis and the post-crisis period, direct public funding to R&D, expressed as GERD funded by the government, has not fallen back to the pre-crisis levels, neither in terms of appropriations nor as effective expenditures. Direct public funding increases in real values up to 2012 and it slightly drops in 2013. Compared to similar economies, e.g. the Nordic countries, the Dutch direct public funding as % of GDP is lower although still above the EU average.

The 2015 Country specific recommendation for the Netherlands is to: "Shift public expenditure towards supporting investment in R&D and work on framework conditions for improving private R&D expenditure in order to counter the declining trend in public R&D expenditure and increase the potential for economic growth." The declining trend in public R&D expenditures has been accompanied by a growth in indirect support. From 2015 onwards the projected indirect support is set to decrease alongside direct support. The total of budgeted direct and indirect support evolves from € 4.8b in 2015 to € 4.5b in 2019.²

In terms of GERD as percentage of GDP, the Netherlands performs at a level similar to the EU28 average (1.97% in 2014), but considerably below e.g. Germany, Denmark and Sweden. It is also still far below the target of 2.5% set by the Dutch government for 2020. Especially the Dutch BERD is low in comparison to the other countries mentioned (1.02% in 2014). The Netherlands is one of the largest net recipients of FP7 funding, having received € 3.371b in funding over the FP7 period (a return percentage of 7.4%, versus a contribution of 5%).³ The annual income from FPs has increased from €165m to €537m (8.1% of available budgets) in the first year Horizon 2020 was in place. For the Netherlands, FP7 funding out-weights the contributions received as core R&D funding through the structural funds (around €180m).

Key developments in the R&I system in 2015 included:

In 2015 the Ministry of Economic affairs set up an *Additional Action plan SME funding*⁴ to supplement a 2014 action plan which was part of the new growth agenda⁵. The plan includes various actions aimed at extending existing measures like the recently established *Netherlands Investment Institute* and the *Future Funds* (continuation of the *SME Innovation Funds*).

¹ Ministry of Economic Affairs (May 2014). National Reform Programme 2014

² Jan van Steen, Total Investments in Research and Innovation (TWIN) 2013-2019, Facts & Figures, Rathenau instituut

³ Ministry of Economic Affairs (October 2015). Progress Report Enterprise Policy 2015. In Dutch.

⁴ Ministry of Economic Affairs (February 2015). Substantially more support for entrepreneurs looking for financial aid. In Dutch.

⁵ Ministry of Economic Affairs (March 2014). Letter on policy for ambitious entrepreneurs. In Dutch.

The total package of interventions has the potential of creating €2.5b of extra funding. In order to help firms find the most appropriate type of financial support, contact points were streamlined into one single "Enterprise Point" and a National Funding Guide was released.

From September 2015 the basic grant system for students was replaced by an extended loan system. This change occurs as part of broader reforms of the educational system, which also includes performance contracts between universities and the ministry of ECS.

In November 2015, the new National Research Agenda was presented, following up on the Science Vision 2025 of November 2014. In this agenda a knowledge coalition of universities, research institutes and governmental organizations consolidated a list of research questions that fit with the scientific strengths, societal challenges and economic opportunities in the Netherlands. This list of questions is supposed to be a basis for strategic allocation of public resources for research.

The Netherlands is very well aligned with most of the ERA priorities. Women, however, are underrepresented in Dutch academia. In 2014 only 17% of professors in the Netherlands were female, which is the lowest percentage of all European member states.⁶ Open access is an important theme during the Dutch EU presidency.

Improving circulation and exploitation of scientific knowledge by public private collaboration is one of the main pillars of the Dutch Enterprise Policy. The 'top sector approach' is concentrated on nine priority areas characterized by R&D intensity and high export opportunities. Apart from R&D tax incentives, several programs have been set up to promote business innovation and to support innovative start-ups and other SMEs.

The identified challenges for the Dutch R&I system are:

Knowledge Transfer: increase the utilisation of the public knowledge infrastructure by SMEs

Increasing private RDI expenditure and economic restructuring

Improve the framework conditions for innovative start-ups: improving access to finance

Maintaining and improving the Human Capital Base for R&I

R&I Challenges

Challenge 1 Increase the utilisation of public knowledge infrastructure by SMEs

Description

One of the key challenges of the Netherlands is to valorise the excellent knowledge it is producing. The indicators in the Innovation Union Scoreboard point at the contrast between the quality of the research system, resulting in relatively many (highly cited) publications and doctorate graduates, versus a modest performance on the account of innovation outputs. A common explanation is found in the business expenditures on R&D, which lags behind the EU average as discussed in the next challenge. Dutch universities do already have strong links with parts of the business sector, as reflected in a comparatively high share of industry funding for university research and the high rate of co-publication. However, SMEs in certain sectors of the economy collaborate less with universities than in other advanced economies (OECD 2014).

Policy response

The necessity to improve the role of firms in diffusing and applying public knowledge is one of the drivers behind the R&I strategy of the Ministries of Economic Affairs and Education, Culture and Science: the Enterprise Policy. Over 2011, several top teams (constituted by representatives from the industry, research institutes and government) identified nine top sectors reflecting unique strengths of the Dutch economy.

⁶ LNVH (2015). Monitor female professors 2015. In Dutch.

In order to carry out basic and applied research in the top sectors, 19 consortia have been established (12 from 2016 onwards). In these so-called *Top consortia for Knowledge and Innovation* (TKIs) many existing research initiatives are being put together. An essential element is that research is conducted through public-private partnerships. Besides supporting regular research projects of the TKIs, the government provides a top-up for research-oriented PPP-initiatives. In order to involve SMEs in these TKI research partnerships, policy measures were simplified and a special intervention for SME participation (*SME Innovation support for Top Sectors; MIT*) was introduced over the past few years.

Assessment

In 2014 industry invested €359m in research conducted in TKIs, which amounts to 44% of total funding for TKI-projects.⁷ Taken together with the public funding, the total TKI R&D-expenditures were €814m. This is above the target of €800m, out of which 40% funded by private parties. The new top sectors approach based on public-private partnerships can play a role in improving the valorisation of public knowledge by bringing about closer cooperation between business and public research performers, while raising the scope and ambition of business innovation including in performing more R&D (OECD, 2014). The bottom up, firm focused, approach taken in the design of the Top Sectors and their research agendas (notably the bi-annual *Knowledge and Innovation Contracts*) ensures involvement of businesses and the direction of policy support at the challenges and opportunities observed by these firms. While R&D expenditures may be low, the Netherlands ranks fifth among EU MS in terms of its share of SMEs introducing product or process innovations. A greater involvement of SMEs in the instruments of the top sector policy could increase the impact of this policy further (OECD, 2014).

Challenge 2 Increasing private RDI expenditure and economic restructuring

Description

The business sector as a whole invests less in R&D and in knowledge-based capital than is the case in other advanced innovation systems: it ranks 12th among EU MS in terms of the BERD as % of GDP and 32nd in terms of non R&D innovation expenditures as % of GDP respectively (CR 2014; OECD 2014). The latter indicator mainly reflects low levels of expenditures on advanced equipment and machinery. The relatively low levels of BERD can partially be explained by the Dutch economic structure which has a strong specialisation in services and some other sectors which have a relatively low formal R&D component. Some of these sectors (e.g. food and agriculture) are internationally very competitive and in comparison to other countries also very R&D intensive. Some other sectors show a lagging productivity which may erode the competitiveness of the economy (OECD 2014).

Policy response

Various predominantly *fiscal measures* have been adapted or newly introduced over the past year(s) and their growth partially compensated for a decline in direct public funding of private R&I (Van Steen, 2015, RIO public funding reports 2014). From 2016 onwards the WBSO (for R&D salary) and RDA (for R&D equipment) schemes will be merged. The future of the Innovationbox, about 25% smaller than the combined WBSO and RDA, depends on the policy response to a recent evaluation and ongoing policy debates regarding corporate taxation in an international perspective.⁸ The Enterprise Policy includes a number of measures to promote innovation in SMEs and larger companies. These include the MIT scheme to promote innovation (and PPP participation) in SMEs. The selected top sectors include a number of high tech sectors (life sciences, advanced materials and high tech systems, ICT), medium tech sectors in which the Dutch has a

⁷ Ministry of Economic Affairs (October 2015). Monitor Enterprise Policy 2015. In Dutch
⁸ <https://zoek.officielebekendmakingen.nl/dossier/34002/kst-34002-83?resultIndex=51&sorttype=1&sortorder=4>

very strong knowledge base (water, chemistry, energy, agro & food, horticulture and logistics) and advanced services (creative industries). Dutch smart specialisation strategies partially mimic the top sector approach, though a number of regions has made a selection of the areas in which they can develop further.

Assessment

The top sector approach promotes the further upgrading of sectors in which the Netherlands is or has the potential to be world leading. The OECD argued for an extension of the coverage of the top sector policy to other (new) sectors or at least encouraging policy learning to improve the performance of underperforming sectors or extend into potential new areas of economic strength (OECD 2014). The latter, which led to an increased policy focus on 'cross-over innovation', would help ensure the necessary dynamism in the light of changing global environments, promote structural change and shift the Dutch economy more towards high tech sectors (OECD 2014). The current system of R&D tax credits, though well-designed, does not serve all of the varying needs of the business sector. Though eligible to firms of any size, large MNCs are thought to benefit from these to a relatively greater extent than SMEs. According to the OECD (2014), rebalancing the system with a sufficient focus on competitive, well-designed direct support instruments could be more effective in stimulating longer-term ambitious innovation. .

Challenge 3 Framework conditions for innovative start-ups: improving access to finance

Description

Young and entrepreneurial firms account for most of net job growth in the Netherlands and are an important source of radical innovation (OECD 2014). Venture capital investments are above the European average and growing according to the NVP (2015). However, in comparison to e.g. BE, DK, SE, and the UK the level of VC as % of GDP is relatively low (IUC 2015). Especially for small firms it remains difficult to fund their innovative activities. For this specific group, the Advisory Council for Science Technology and Innovation expressed its concerns regarding the accessibility of existing policy instruments. It also stated that SMEs are still poorly connected to the initiatives that are central in the Enterprise Policy.⁹

Policy response

Recognizing that especially small firms face problems with acquiring capital, there are several additional (non-fiscal) policies exclusively devoted to facilitate private R&D spending by SMEs. These include the aforementioned SME Innovation support Top Sectors (MIT) and Future Funds, which covers Innovation Credits (also available to larger businesses), SEED capital and Fund-of-Funds, SME loan guarantee scheme (BMKB), The Early stage funds (VFF), micro-financing, and the Growth facility scheme (CR 2015). Innovative public procurement is also actively promoted (Dialogic 2015). The Dutch Venture Initiative (DVI) is a fund set up by the Ministry of EA and the European Investment Fund (EIF) for providing investment capital to rapidly growing companies. Other measures include a programme that offers SMEs support in acquiring bank credit (MKB-Go), an action plan to increase the equity capital of SMEs and an increase in the ceiling of the micro-financing facility (Qredits; now continuing without public funding). The government partially finances platforms for crowdfunding. Actual use of the various instruments is supported with efforts to lower administrative barriers. A striking example in this respect is the merger of Syntens and the Chambers of Commerce as of January 2014. This should make it easier for SMEs to find their way to support, just like the recent launch of a National Funding Guide (October 2015).

⁹ AWTI (2014). [Balance of de Topsectors 2014](#).

Support for high tech startups was previously supported through the '*Subsidy scheme Knowledge Exploitation*' (SKE). Many of the 18 locally oriented SKE-initiatives for technostarters have been continued as *Valorisation Programme* projects. Another part of the Technostarter programme that is being continued is the *Business angel program* (BAP). This instrument is designed to bring entrepreneurs and business angels in contact with each other, for instance via the [Business Angel Network](#) (BAN). Additional policy efforts partially focus on attracting foreign startups to set up shop in The Netherlands for which among others a startup visa was implemented (RVO, 2015).

Assessment

In total, 65% of public R&D budgets devoted to private actors was used by SMEs in 2014 (EA, 2015) and the share of SMEs innovating increased to 54% in the period 2012-2014. A recent evaluation of the Dutch innovation and entrepreneurship policy mix raised questions about a substantial share of funding going to ordinary rather than innovative and growth-oriented SMEs.¹⁰ Because access to finance is still found to be insufficient, the Ministry of EA and the EIF decided in March 2016 to continue their DVI initiative with DVI-2.¹¹ As DVI-1 with its budget of €180m is regarded as being successful, the EA and EIF will now provide €100m each.

Combined with another €100m contribution by institutional investors, the final (leveraged) amount of capital is calculated to result in €1.2m if also private funding parties join in. The Ministry of EA's assessment is that this is a solid basis for improving access to finance.

Challenge 4 Maintaining and improving the Human Capital Base for R&I

Description

The Netherlands has a strong and highly educated workforce for innovation, but has faced challenges responding to emerging labour market needs (OECD, 2014). The increasingly fierce competition for top international talents will exacerbate problems in addressing skills shortages which are partially due to an ageing population (OECD, 2014). The IUS 2015 indicator for the Dutch population aged 30-34 with a tertiary education shows a strong performance (43.1%) in comparison to the EU average (36.9%). However, while the EU2020 target of 40% for graduation success rates in higher education has been surpassed, the Netherlands scores low on this indicator in comparison to peer countries such as Sweden, Finland, Norway or the UK (IUS, 2015). The main challenge lies in the lack of science and engineering students to meet prospective labour demand, though in the past the CPB has raised questions about the extent to which these perceived shortages reflect reality (CPB, 2005).

Policy response

The national Technology Pact 2020 (signed in 2013) forms a non-binding broad agreement between industry, trade unions, educational institutions at various levels, and governments at various levels to spur technology and technological education. Together with the human capital agendas of the top sectors, it is intended to address the shortage of skilled workers. Over the coming years, the Dutch government will invest the money from the cancelled basic student grant directly into the enhancement of the quality of higher education. This amount, €620m in 2016, increases to a maximum of €1bn per year. Examples of investments include intensive support for students; increase of contact hours; rewards for good scientists who also teach. Students, universities and colleges are given a major say in the destination of the money for higher education. Support for prospective students from less advantaged backgrounds remains. Another major initiative to strengthen quality and relevance of education is the establishment of approximately 40 Centres of Excellence and Centres of Craftsmanship. These centres,

¹⁰ Dialogic (May 2015). [Evaluation Innovation and Entrepreneurship Policy Mix](#) (article 12/13) 2009-2013.

¹¹ Ministry of Economic Affairs (March 2016). [Substantially more support for rapidly growing enterprises](#). In Dutch.

drawing upon intensive involvement of (local) enterprises, aim to contribute to the transition of vocational training, to innovation projects, and to the development of life-long-learning programs.¹²

Assessment

Co-ordination in the Human Capital Agendas of the Top Sectors and the Technology Pact could help improve responsiveness to labour market demand. Potentially as a response to the greater personal costs of education or the technology pact, the number of university students choosing a scientific or technological study has increased in the past ten years from 26 to 35% (Platform BetaTechniek, 2015). The share of technical students in Universities of Applied Sciences (UAS) and in secondary education has also increased markedly. The share of female science and technology students is gradually increasing. Labour shortages, though diminishing, remain.¹³ Existing initiatives to encourage profiling and specialisation of university teaching and research activities, e.g. the performance agreements between the Ministry of Education, Culture and Science and the universities, could enhance efficiency. This would especially be the case if educational quality would get valued higher in the assessment criteria universities adhere to (like the Standard Evaluation Protocol, which only considers research quality).

As the European Semester SWD (2014) indicated, care should be taken to promote skill enhancement broadly.

¹² PBT: [Public Private Collaboration in Centres of Excellence and Centres of Craftsmanship](#). Accessed on 2-4-2016.

¹³ See for instance the websites of [Technology Pact](#) and [Platform BetaTechniek](#).

1. Overview of the R&I system

1.1 Introduction

With 16.9mln (2015) inhabitants living on 42500 km², the Netherlands is a small but relatively densely populated country: while Dutch territory accounts for less than 1% of EU28 total area in km², Dutch inhabitants represent about 3.3% of the total EU28 population.¹⁴ With a GDP of €663bln, the Netherlands have a share of 4.75% of the EU28 total GDP (2014).¹⁵ As can be derived from this, the GDP per capita is well above EU28 average. Table 1, below, shows how the GDP per capita grew from €38,500 to €39,300 in the period 2012-2014. Since the Dutch population is hardly growing, a growth in total GDP can largely be explained by the increased GDP per capita.

Indeed, after GDP drops of 1.1% and 0.5% in 2012 and 2013, there was a slight indication of growth in 2014. The +1% in that year was still below the EU28 average of +1.4%, but the economic recovery is expected to increase rather soon. The CPB Bureau for Economy Policy Analysis revised her original 2015 growth estimates of 1.7% into 2.0%, even despite recent decisions to cut down the exploitation of shale gas reserves.¹⁶ For 2016, the expectation is even better with an estimated growth figure of 2.4% (compared to a 1.9% for Europe as a whole). One explanation for this positive development in face of declining world trade is that Dutch exports tend to be distributed across a wide range of countries, making it less vulnerable to sudden local changes. Moreover, after initial increases in industrial production, corporate investment, and improvements in the housing market, finally also consumer confidence is observed to be growing. Meanwhile, a period of severe budget cuts has led the Dutch budget deficit (as % of public budget) to decline to 2.3%. This figure lies well below the EU imposed maximum of 3% and actual average of 2.9%. According to the CPB, it might even be down to 1.4% by 2016.¹⁶

According to Table 1, unemployment is one of the last economic factors not showing any progress so far. The current cabinet focuses on creating jobs primarily through competitiveness (or demographic changes), and this is reflected in existing policies. As a result, only few policies address the issue of unemployment directly, in contrast to policies aimed at enhancing innovativeness. Nevertheless, it should be noted that on this account the CPB is optimistic as well. Although the labour market is expanding through increased participation, unemployment figures for 2015 and 2016 are 6.9% and 6.7% (respectively).

¹⁴ Eurostat (February 2015). [Population \(demography, migration and projections\)](#).

¹⁵ Eurostat (October 2015). [Gross domestic product at market prices](#).

¹⁶ CPB (September 2015). [Macro-Economic Outlook 2016](#).

Table 1: Main R&I indicators 2012-2014¹⁷

Indicator	2012	2013	2014	EU28
GDP per capita	38500	38700	39300	27400 (2014)
GDP growth rate	-1.1	-0.5	1	1.4 (2014)
Budget deficit as % of public budget	-4	-2.3	-2.3	-2.9 (2014)
Government debt as % of GDP	66.4	67.9	68.2	86.8 (2014)
Unemployment rate as percentage of the labour force	5.8	7.3	7.4	10.2 (2014)
GBAORD in €m	4676.8	4794.3	4924.4	92828.1 (2013)
GERD in €m	12512	12743	13075	271558.8 (2013)
GERD as % of the GDP	1.94	1.96	1.97	2.03 (2014)
GERD (EUR per capita)	747.9	759.5	776.9	558.4 (2013)
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	2.7	2.7	2.7	5.7 (2014)
Employment in knowledge-intensive service sectors as share of total employment	45.3	46.7	47.0	39.8 (2014)
Turnover from innovation as % of total turnover	11.8	-	-	11.9 (2012)
Value added of manufacturing as share of total value added	19.3	18.5	-	26.2 (2012)
Value added of high tech manufacturing as share of total value added	2.1	1.5	-	2.5 (2012)

While Table 1 suggests that GBAORD is rising, actual budget outlays for the near future point at the opposite direction. Partially this is due to the termination of the Economic Structure Enhancement Fund (FES). Between 1995-2010, €33bn of revenues from gas sales were invested in reinforcing the Dutch 'knowledge economy'.¹⁸ Unlike other European countries having large amounts of natural resources (e.g. Norway), the Netherlands have not stored their gas revenues in a national equity funds. Instead the incomes have long been used to make the economy more competitive on the long term, for instance by improving infrastructures (€3.8bln was spent on knowledge infrastructure). With the decision to de-activate the FES, public funding for research has gotten under pressure after 2010. Except for financing of some R&I programmes not phased out yet, gas revenues flowed straight into national earnings from this moment on. In 2014, however, a Future Fund was established again in order to prepare the Dutch economy for expected decreases in gas revenues. Still, the Future Fund started out rather modestly with its initial budget of only €200mln.

The government's direct expenditure on R&D, at 5.0bln in 2015, is expected to drop below €4.7bln from 2018 onwards. Not included in this figure is the indirect fiscal support for R&D and innovation. The WBSO's and RDA's combined budget will slightly increase from €1bln to €1,1bln during that period. Looking at how the Innovationbox has been developing over the past years (from €351mln to €679mln in 2010-2012), its current size could be roughly equal to the WBSO/RDA-combination¹⁹ (see section 3.5.2 for more details).

¹⁷ Eurostat data provided by JRC-IPTS

¹⁸ Court of Audit (October 2014). [Besteding van aardgasbaten: feiten, cijfers en scenario's](#).

¹⁹ Ministry of Finance (January 2015). [Use of Innovationbox 2010-2012](#). In Dutch.

In terms of total GERD as percentage of GDP, the Netherlands (1.97% in 2014) perform at a level similar to the EU28 average (2.03%). This is still far below the target of 2.5% (more or less the current OECD average²⁰), as originally set by the Dutch government when launching the Enterprise Policy for research and innovation. The underperformance is sometimes nuanced by pointing at the Dutch industry structure, or by pointing at expenditures not grasped by GERD figures (e.g. human capital), but it is generally agreed that more investments in R&D is essential for the economy's future. In particular the business-funded R&D remains relatively low (1.02% in 2014). As far as data are available, however, one can conclude that turnover from innovation as a percentage of total turnover does catch up with the European average now. While in 2010 this used to be 10.8%, compared to EU27 average of 13.4%, the 2012 figures are roughly equal at 11.8% and 11.9% respectively.

Finally, Table 1 presents indicators on the industrial profile of the Netherlands. While the value added by manufacturing decreased from 19.5% to 19.3% to 18.5% of total value added (2010-2012), the share of specifically high-tech manufacturing first increased from 1.8% to 2.1% and then dropped to 1.5%. Employment figures for high- and medium-high-tech manufacturing sectors remained stable at 2.7% of total employment. This figure is less than half of the European average. The observation that services account for an important part of the Dutch economy is strengthened by the growth of the employment share in knowledge-intensive service sectors.

1.2 Structure of the national R&I system and its governance

1.2.1 Main features of the R&I system

The R&I system in the Netherlands is overall highly centralised, especially after the government abolished regional programmes like Peaks in the Delta about half a decade ago. Currently it is mostly central government that is responsible for formulating both research and innovation strategy and policies. An exception is found in the smart specialisation agendas drawn up by four groupings of provinces (see section 2.4). Within the regions, additional R&I support is provided by the (since 2014) five regional development companies (ROMs). The shares of these companies are owned by the Ministry of Economic Affairs and by the authorities of the provinces in which they are located. The ROMs deliver an important contribution to the creation of an entrepreneurial ecosystem. Apart from providing funding or financial participation to (innovative) companies, they are also actively engaged in developing business areas and attracting FDI. In the past few years, several similar organisations have been established throughout the entire country. Whereas the ROMs tend to operate as executive agencies, the Provinces themselves also actively develop (and finance) R&I policy.²¹

At an even more local level, 2015 has seen a myriad of 'smart city' initiatives. Characteristic for these plans is the ambition to use city-level dynamics as a driver for innovation towards sustainable and competitive societies. Also occurring at the city level is the ongoing trend of establishing start-up centres or ecosystems. Amsterdam, Rotterdam, Utrecht and Eindhoven are but a few examples of cities who have significantly intensified their support for start-ups in 2015. Apart from being driven by economic programs at the regional level, recent startup activity is also spurred heavily by StartupDelta; an initiative aimed at connecting different startup centers into one startup ecosystem. Amsterdam recently adopted a Startup in Residence initiative to involve start-ups in solving municipal problems, and her successful incubator-program 'Rockstart' will soon open also at the university campus in Nijmegen. Indeed, activities related to start-ups are often performed in accordance with higher educational institutions located in the region.

²⁰ OECD (August 2015). [Main Science and Technology Indicators](#).

²¹ Bodewes Beleidsadvies (2014). [Regional activities and investments concerning R&D and innovation](#). In Dutch.

Illustrative is also the covenant signed by the Eindhoven University of Technology (TU/e) and the municipality of Eindhoven, in which they agree to use locally available expertise in technology and design to address societal problems. Similarly, in line with national tendency to focus more on the opportunities of ICT, the TU/e and Tilburg University announced a 'Big Data' Graduate School in the city of Den Bosch. The presence of universities is thus clearly of influence on the role a certain region is playing in the national R&I system. Finally, the Social and Economic Council of the Netherlands (SER) published the report 'City Agenda' (Agenda Stad) in August 2015. In this advice she argues for better coordination between cities and their regions, both to boost innovativeness as well as to distribute more evenly the welfare and job opportunities associated with this (see section 2.2.1).

Contrary to some other European countries, the Netherlands does not have an outspoken dominant source of R&D funding. The government share in GERD has been around the EU28-average level of 33% (which hides the existence of high variation between countries) for the past few years. The business sector does play a bigger role with its share of 52% (2014), but it is far from levels above 60% like in Finland, Germany or Denmark. Apart from a minor increase in funding from abroad, the balance between public and private R&D funding has been stable over the years.

Looking at research performance, universities seem to play a significantly larger role than institutes like PRO's. In percentage of GDP, the latter are just below the EU28 average (0.26%) with 0.24%.²² The universities on the other hand perform R&D at expenditures equivalent to 0.64% of GDP, which is well above the EU28 average of 0.46%. Within the Dutch binary university system, consisting of research universities and universities of applied sciences, research is predominantly executed by the first. In the ECS budget for 2016, €1.7bln is designated for institutional funding of university research.²³ The 37 applied universities typically have research expenditures of about €100mln only (not counting €20mln of contract research), consisting mainly of €69mln institutional funding and €27mln through so-called RAAK-subsidies for research projects (in 2016; RAAK-subsidies were €10mln less before 2014).

R&D expenditures amongst firms of different sizes are typically highly skewed. While firms with 10-50 employees account for 78% of Dutch firms with more than 10 employees, this group only covers 13% of total business R&D.²⁴ The 17% of firms having 50-250 employees contributes another 26%, and the two top classes of 250-500 employees and 500+ employees (both representing 2% of total firm population) bring in no less than 14% and 47% of R&D investments, respectively. This distribution is similar to the average of EU countries with a substantial amount of BERD. Strong variation exists, however. While mid-size firms (250-500 employees) have a relatively more important role in Denmark (43% of BERD), several other countries find their business R&D mainly in the category of largest firms (around 80% or more in Germany, France and Italy).²⁵

The picture for innovation rather than R&D costs is spread more evenly, as the group of 10-50 employees now accounts for 30%, the middle group of 50-250 employees spends 21%, and the top 4% of firms together only correspond with 48% of total innovation expenditures. This difference in distribution points at the difference between formal R&D being concentrated in large companies, and innovation (a broader concept) being found also in smaller firms.

²² Ministry of Education, Culture and Science. [International comparison of R&D expenditure as a percentage of GDP and per performance sector](#). Based on OECD 2013 figures. Accessed on 15-10-2015.

²³ Ministry of Education, Culture and Science (September 2015). [Budget 2016](#).

²⁴ CBS Statline: Businesses: ICT and Innovation. Own calculations. Accessed on 4-10-2015.

²⁵ Eurostat. Business enterprise R&D expenditure (BERD) by size class and source of funds. Accessed on 8-1-2016.

1.2.2 Governance

R&I strategy

The current R&I structure has been in place in the Netherlands since the formation of the Rutte cabinet I and II in 2010 and 2012, respectively. As described in section 2.1, the Enterprise Policy by the Ministries of EA and ECS mainly covers the business side of research and innovation. In addition, the Ministry of ECS also runs her own science and education policies. All strategies are well-aligned and relatively stable. Apart from the fact that the Enterprise Policy does not have a clear end date, and therefore is multi-annual, several of its main instruments are in fact a continuation of pre-existing measures. This holds for instance for the financially most substantial instruments, the WBSO/RDA and the Innovationbox (continuation of the Patent Box). Also, funding for applied research is for instance to a large extent focused on the 19 *TopConsortia for Knowledge and Innovation* (TKI's, in which diverse combinations of stakeholders engage in public-private partnerships), that followed up on the existing *Large Technological Institutes* (TTI's). From 2016 onwards, the number of TKI's will be reduced to 12.²⁶ When establishing the Enterprise Policy, stakeholders like PRO's and private companies have been engaged by having the possibility of forming *top teams* and signing *Innovation contracts* (see section 2.1). In the science domain, the implementation of the Enterprise Policy affected the way how funding is allocated. Since 2012, a part of ECS' research funding for NWO has been allocated (by NWO) to research projects fitting in at least one of the nine Top Sectors. Also including contributions by the EA ministry this amounted to €275mIn in 2015, which is claimed to be insufficient for truly creating focus.²⁷ Also, although the policy orientation can said to be clear and effectively implemented, it is increasingly clear that the strategy is not fully backed by the scientific community. Academics have kept debating the decision to steer funding towards applied projects. In order to resolve the question what kind of research should be supported, the Ministry of ECS did a public consultation when drafting her National Research Agenda (see section 2.2).

Main players

The main actors and institutions in the Dutch science, research and innovation governance system are the Ministry of Education, Culture and Science (ECS) and the Ministry of Economic Affairs (EA). The main bodies responsible for managing and implementing policies are the Netherlands Organisation for Scientific Research (NWO), the Technology Foundation STW and the Taskforce for Applied Research SIA (both part of NWO), the Royal Netherlands Academy of Arts and Sciences (KNAW), and RVO.nl (an agency of EA).

The Advisory Council for Science, Technology and Innovation (AWTI), an independent body, advises the government and parliament on policy relating to scientific research, technology development and innovation, with several yearly thematic reports. The AWTI also acts as a council the government can consult. Several other bodies are of relevance for science policy advice as well, such as the Scientific Council for Government Policy (WRR) and the Rathenau Institute. Also the Association of Universities in the Netherlands (VSNU) tends to play a key role in debates about how to organize science policy. The Social and Economic Council of the Netherlands (SER) advises on issues related to for instance the labour market.

²⁶ Ministry of Economic Affairs (October 2015). [Progress Report Enterprise Policy 2015](#). In Dutch.

²⁷ Rathenau Institute (March 2016). [Chinese borden - Financiële stromen en prioriteringsbeleid in het Nederlandse universitaire onderzoek](#).

Monitoring

The Ministry of EA has established an extensive monitoring system to evaluate the effectiveness of the Enterprise Policy and its progress. The pressure to arrange this appropriately has been driven up by several reports, stating that there was no comprehensive overview of the policy instruments supporting innovation, or a basis for assessing the impact of R&D&I-policy. In a reaction to this criticism, a website was set up where all innovation policy instruments are presented (www.volginnovatie.nl). An expert committee (the commission Theeuwes) was also asked to develop a new standard for evaluating the impact of innovation policy instruments, resulting in the 2012 'Dare to measure' report.²⁸

The evaluation system for the Enterprise Policy includes, amongst others, the yearly publication of monitors with a variety of statistical indicators. These are the Monitor Top Sectors (by Statistics Netherlands) and the Monitor Enterprise Policy (by EA). The monitors are complemented with a Progress Report, in which output indicators, international benchmarks and recent evaluation results or impact assessments are presented. Moreover, the overall evaluation of the Top Sector Policy is planned for 2016 (postponed from 2015). A recent development, partially inspired by suggestions made in earlier evaluations, is that the Ministry of Economic Affairs announced to conduct several policy experiments (see section 2.2). Characteristic for these interventions is that possibilities to evaluate are explicitly taken into account when designing the instrument, notably by finding a situation in which a control group and an experimental group can be distinguished.²⁹

Developments in the field of education and science are being monitored permanently as well. In reports called '*Trends in Focus*' ('Trends in Beeld'), the ECS Ministry presents statistics on quality and performance. The Ministry of ECS also monitors relevant developments by collecting Science, Technology and Innovation Indicators published by sources like OECD. The *Standard Evaluation Protocol 2015-2021*, published in March 2014 by the VSNU, NWO and KNAW evaluates science (but not education) on a structural basis. The quality of Dutch education is being assessed by the ECS' Education Inspectorate, in its yearly 'The State of Education in the Netherlands' report, though this evaluation does not include higher education.

Use of macroeconomic models

Analyses based on macroeconomic models mostly come from the CPB Netherlands Bureau for Economic Policy Analysis. Although the Macro-Economic Outlook for 2016 does not report any assessments of the influence of R&I, the CPB did publish several relevant studies in 2015. One of them concerns the structural determinants of growth³⁰, another points at the fact that innovation does spur growth and productivity but also inequality.³¹ The CPB has indicated it has limited capabilities when it comes to modelling the impact of R&D&I and therefore does not include R&D in its macro-economic models.³² Noteworthy here is also a micro-econometric meta-analysis of tax incentives uses around the world³³, showing that they are unlikely to have major influence on the innovativeness of economies.

²⁸ Impact Evaluation Working Group (2012) [Dare to Measure](#).

²⁹ Ministry of Economic Affairs (May 2015). [Policy evaluation Economic Affairs](#). Letter to Parliament 30 991 (23).

³⁰ CPB (June 2015). [Structural determinants of growth in Europe](#). In Dutch.

³¹ CPB (July 2015). [Pressures on employment in middle segment of the labour market](#). In Dutch.

³² <http://www.cpb.nl/publicatie/een-macro-economische-analyse-van-het-rendement-op-publieke-kennisinvesteringen-0>

³³ CPB (June 2015). [More R&D with tax incentives? A meta-analysis](#).

1.2.3 Research performers

Amongst the most prominent research performers in the Netherlands, we find 13 research universities and 37 universities of applied sciences (more focused on technical and vocational training). Between 2000 and 2013, the total available amount of research capacity (in fte) at the research universities increased with 35%.³⁴ During this period the share of general (first-flow) university funding in total funding decreased from 52% to 43%, while teaching and contract research became more important. The research capacity is spread rather unevenly, with three universities having more than 2000fte of researchers compared to one with 1000fte, one with 500, and one with 100.³⁵ Over the course of 2015, the AWTI published several reports on research and applied universities. The main advice was to ensure quality of education in research universities, to put research higher on the agenda of the universities of applied sciences, and to let the two domains interact better (see section 2.2.1).

Research is also being conducted by various kinds of research institutes, including PRO's, RTO's and medical hospitals. Some of the public research institutes are financed by the NWO and the KNAW: both organisations take on the role of an umbrella organisation for research institutes that carry out basic and strategic research in various disciplines. The existing Leading Technological Institutes (TTIs), such as Dinalog and the Dutch Polymer Institute, have been brought into the Top Consortia for Knowledge and Innovation (TKIs) during the past few years. The Netherlands Organisation for Applied Scientific Research (TNO), DLO and the Large Technological Institutes (GTIs: Deltares, ECN, NLR, MARIN) have recently joined into the TO2 federation. After having presented their joint strategic agenda in 2014 (for 2015-2018)³⁶, the TO2-institutes organized their first information day in May 2015.³⁷

As for the private sector research community, two organizations worth mentioning are the Confederation of Dutch Industry and Employers (VNO-NCW) and MKB-Nederland. While VNO-NCW represents in particular the medium to large companies in the Netherlands, MKB-Netherlands mainly looks after the interests of SME's (just like the Chambers of Commerce). Both organisations exert influence on the policy agenda by participating in committees and discussion platforms and by publishing vision documents. VNO-NCW has been releasing strategic outlooks on topics like [entrepreneurship](#), [innovation](#) (e.g. patents), and [internationalization](#).³⁸ It also runs a Technology Commission, in which the most R&D-intensive companies of the Netherlands discuss on innovation matters and prepare advice to the government. In total, VNO-NCW covers [160 branch organizations](#), which amounts to over 115.000 enterprises (80% of Dutch medium-sized companies).³⁹ The sectors most prominently represented in the research community are those who managed to establish a top team and associated Top Sector (see section 2.1, also for listing of the nine key sectors). Together the Topsectors represent 89% of R&D-intensive firms. Details about the composition and performance of this part of the private sector research community are published in the annual CBS' Top Sector Monitor.⁴⁰ Further information on the main research performers in the Netherlands is included in Annex 3.

³⁴ Ministry of Education, Culture and Science. [ECS in numbers: academic research](#). Accessed on 15-10-2015.

³⁵ Ministry of Education, Culture and Science. [ECS in numbers: Research capacity per university](#). Accessed on 15-10-2015.

³⁶ Minister of Economic Affairs (july 2014) – [Reaction to strategic agenda TO2 federation](#) (in Dutch).

³⁷ Ministry of Economic Affairs (October 2015). [Progress Report Enterprise Policy 2015](#). In Dutch.

³⁸ VNO-NCW and MKB-Nederland (2014). http://www.vno-ncw.nl/SiteCollectionDocuments/Brochures/European_Outlook_2014_compleet.pdf [European Outlook – Europe: vital to Dutch companies](#).

³⁹ Figures and information retrieved from VNO-NCW (February 2015). <https://www.vno-ncw.nl>

⁴⁰ CBS (October 2015). [Top Sector Monitor 2015](#). In Dutch.

The structure of the national research and innovation system and its governance is presented in the figure below:

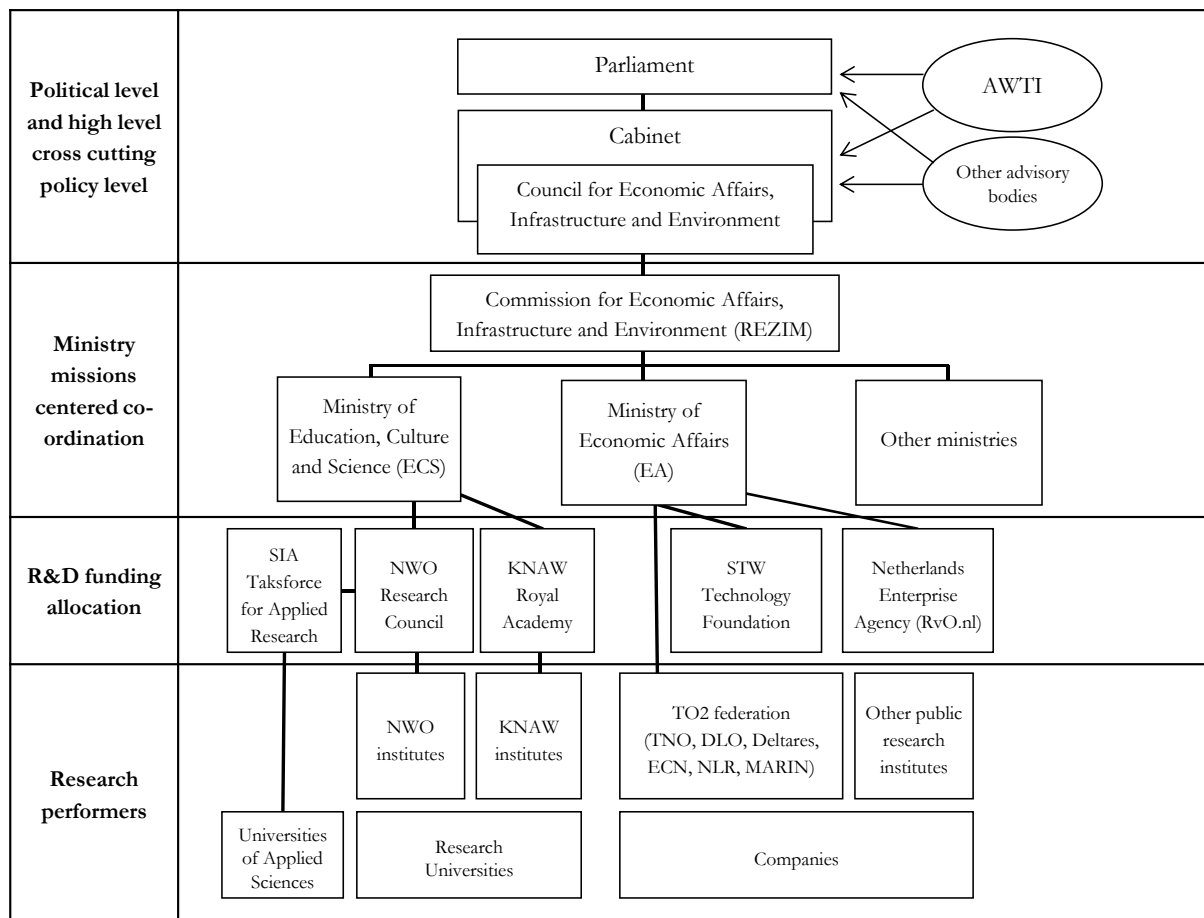


Figure 1: Structure of the national research and innovation system and its governance

2. Recent Developments in Research and Innovation Policy and systems

2.1 National R&I strategy

The Netherlands have a R&I strategy overarching (mainly applied) research, innovation and even entrepreneurship. The so-called Enterprise Policy is primarily governed by the Ministries of ECS and EA, but occasionally also other departments are involved (for instance Foreign Affairs, when it comes to attracting FDI). As its name indicates, the Enterprise Policy does have a slight focus on particularly the business side of transforming research into innovative solutions. Science and education aspects not covered in the Enterprise Policy are governed separately by the Ministry of ECS. In both domains public action is designed strategically and coherently, but in their own idiosyncratic ways. Typically, the Ministry of ECS has a more long-term hands-off approach, whereas the ministry of EA has a more hands-on approach and tends to steer more directly and interact and cooperate intensively with the relevant actors. Although policy turbulence used to be higher in the domain of economy over the past period, 2015 is a year in which debates on science issue seem to outnumber debates on policy.

The R&I and science and education tracks are defined and managed separately, but there are many examples where the two meet and policy action is coordinated between the two. Typical examples include the Top sector approach that is initiated from the innovation-side but where for example NWO is intensively involved. Similarly, a large initiative such as the national Technology Pact, including the establishment of Centres for Innovative Craftsmanship and Centres for Expertise, is an initiative where the two ministries collaborate and coordinate activities. Finally, many of the innovation schemes as initiated and managed by the Ministry of EA involve the participation of Higher Education Institutions. Higher education policies are typically integrated in science policy, but the remainder of the education pillar is mostly seen as a separate policy field (although there are again places where policy actions meet). The European dimension and link to H2020 challenges is present, but (at least originally) more on a case by case basis than in a systematic way.⁴¹

Before describing the Enterprise Policy in more detail, it is important to mention that some strategies within the science domain are relatively independent of the Enterprise Policy. For instance, partially as an answer to the overall assessment of science policy as well as advices by the AWTI, the Ministry of ECS presented its Science Vision 2025 in November 2014.⁴² The three main ambitions of the vision are: Dutch science of worldwide significance, science with maximum impact, and Dutch science as a breeding ground for talent. As for the first goal, the vision outlines intentions related to performance-agreements with universities, reorganization of NWO, strategic use of research infrastructures, and a dynamic system of research institutes. Maximum impact of science is to be pursued through support for open access and plans to better involve citizens, societal organizations, businesses, applied universities, students, and authorities. Measures focused on scientific talent, finally, include plans to award a higher variety of scientific qualities (related to research, education and valorization) as well as attracting foreign researchers, creating promising career opportunities, achieving more gender equality, and reducing publication pressure.

⁴¹ Dialogic (May 2015). [Evaluation Innovation and Entrepreneurship Policy Mix](#) (article 12/13) 2009-2013. In Dutch.

⁴² Ministry of Education, Culture and Science (November 2014). [Science vision 2025](#). In Dutch.

How exactly the goals of the Science Vision are going to be achieved is described in the Strategic Agenda for Higher Education and Research 2015-2025, called 'The value(s) of knowing'.⁴³ Apart from outlining measures related to education quality, accessibility & diversity, and science-society connections, the extensive document also contains an actual investment agenda. The agenda thereby specifies how the €620mln made available through study costs reforms will be spent. A particularly topical issue is the funding of HEIs, as the Ministry of ECS has been experimenting with performance-agreements with universities in the period 2012-2015. Because the evaluation of this experiment is foreseen for 2016, there currently is no conclusive answer on how it will be continued. Meanwhile, on request of the Ministry of ECS itself, reflections on the Strategic Agenda and the Science Vision were presented by the Social-Economic Council⁴⁴, the Education Council⁴⁵ and the Rathenau Institute⁴⁶.

Overall strategy: Enterprise Policy

The Enterprise Policy was introduced by the Ministries of ECS and EA in 2011.^{47,48} It includes both the plans regarding generic and more specific R&I policies, although the latter (most often referred to as the Top Sector approach or policy) initially received considerably more attention in the public and policy debate. The last year this seems to change, as it is understood that there are little amounts of funding involved in the Top Sector approach, while compared to this the generic policy has relatively large budgets (especially the tax components, see for instance the policy review of article 12 and 13 of the budget of the Ministry of EA⁴⁹).

In the ministries' view, ambitious entrepreneurship is considered as crucial for wealth creation in the Netherlands. It is argued that societal and economic challenges demand for a policy that gives 'room for entrepreneurs'. A key principle of the Enterprise Policy is that the government should not steer with rules and subsidies. Instead, it should ensure that companies have sufficient room to do business, to invest, to innovate and to export. As far as innovation is directly supported, this mostly concerns forms of public-private collaboration.

Key elements in the current enterprise/innovation policy are less subsidies in exchange for generous R&D tax incentives; less and simpler rules; broader access to corporate finance (credit facilities); better utilization of the public knowledge infrastructure by businesses; and better alignment of fiscal policy, education policy, foreign policy and diplomacy with the needs of businesses. The formal longer-term policy ambition is to bring the Netherlands in the top 5 of knowledge economies in the world (in 2020), to increase of Dutch R&D-expenditures to 2.5% of GDP (in 2020), and to create Top consortia for Knowledge and Innovation (TKIs) in which public and private parties participate for more than €500m, of which at least 40% is funded by the business sector (in 2015).²⁶

⁴³ Ministry of Education, Culture and Science (July 2015). [The value\(s\) of knowing: Strategic Agenda Higher Education and Research 2015-2025](#). In Dutch.

⁴⁴ Social-Economic Council (October 2015). [Learning in the higher education of the future: advice on the Strategic Agenda for Higher Education 2015-2025](#). In Dutch.

⁴⁵ Education Council (October 2015). [Advice on the Strategic Agenda for Higher Education 2015-2025](#). In Dutch.

⁴⁶ Rathenau Institute (October 2015). [Choices for the future of Dutch science](#). In Dutch.

⁴⁷ Ministries of Economic Affairs and Education Culture & Science (2011) [To the top: Towards a new enterprise policy](#).

⁴⁸ Ministry of Economic Affairs (February 2015) [To the top: Enterprise policy in action\(s\)](#).

⁴⁹ Dialogic (May 2015). [Evaluation Innovation and Entrepreneurship Policy Mix](#) (article 12/13) 2009-2013. In Dutch.

The basic rationale for the enterprise/innovation policy is that globalization and societal challenges (e.g. ageing, food security, scarcity of raw materials, reduction of biodiversity and climate change) not only create threats but also (economic) opportunities that can be seized by companies. This requires an excellent public knowledge infrastructure that is better aligned with the needs of the business sector. A recent development is the creation of a Dutch [National Research Agenda](#). By consulting scientists, companies and citizens, a knowledge coalition of universities, research institutes and governmental organizations consolidated a list of research questions that fit with the scientific strengths, societal challenges and economic opportunities in the Netherlands. This list of questions is supposed to be a basis for strategic allocation of research resources, mostly by NWO (funded primarily by the ministry of ECS, and to a smaller extent also by EA). The business sector, in turn, should invest more in R&D and innovation according to the Enterprise Policy. Furthermore, strong regional clusters are important because they contribute to the attractiveness of the Netherlands as a location for (foreign) knowledge-intensive companies. Therefore, the national and regional governments should collaborate more intensively. In the national R&I strategy, regional governments are invited to align their policy agenda and budgets with the priorities in national policy (see also section 2.4 for smart specialization strategies). Also the European level is considered as important, not only in terms of the internal market and a level playing field, but also in terms of aligning 'top sectors' in the Dutch economy with EU programmes for R&I (Horizon 2020).

In the past, various institutes and councils have called for societal challenges to be taken on board more explicitly. Such critiques have recently been expressed by notably the Scientific Council for Government Policy (WRR)⁵⁰, and the AWTI⁵¹. Partially in reaction to the earliest of those comments, the ministries of Economic Affairs and Education, Culture and Science released a brochure, named 'Global Challenges, Dutch Solutions', in which they clarify the link between societal problems and the Top Sector Policy.⁵² This link is twofold: EA states that the R&D&I it is supporting will generate innovations with relevance for societal problems, and secondly, it stresses that by making participation in the Horizon2020 program part of the Top Sector policy, also the grand challenges have become part of Dutch R&D&I dynamics. In 2015, societal challenges keep showing up as a central theme in research policies, especially when it comes to the topic of circular economy.⁵³ Furthermore, now that also the Creative Industry and Logistics embedded societal challenges in their innovation contracts (2016-2017), all of the Topsectors have formulated a way to direct NWO research funding to 'Responsible innovation'.⁵⁴

Top teams and top sectors

At the request of the Cabinet, several top teams were established over the course of 2011. These *top teams*, contributing actively to the strengthening of the new enterprise policy, are constituted by representatives from industry, research institutes and government. The government has implemented various actions based on the advice of the top teams. In total nine top sectors were identified, i.e. Agro-food; Horticulture and propagating stock; High-tech materials and systems; Energy; Logistics; Creative industry; Life sciences; Chemicals; and Water. The top sectors build on the unique strengths of the Dutch economy.

⁵⁰ WRR (October 2014). [Towards a learning economy](#) (English summary).

⁵¹ AWTI (October 2013) Top Sector Balance ('[Balans van de Top Sectoren](#)') 2013. In Dutch.

⁵² Ministries of Economic Affairs and Education Culture & Science (February 2014) [Global Challenges Dutch Solutions](#).

⁵³ See for instance: Ministry of Economic Affairs (June 2015). [Midterm review Green Growth 2015](#). In Dutch.

⁵⁴ NWO (October 2015). [Prominent position Responsible Innovation programme in Innovation Contract](#).

They are characterized by strong market and export positions, a good knowledge base, public-private collaborations and a potential to contribute to innovative solutions for societal challenges. According to CPB figures published in the Top Sector Monitor 2015⁵⁵, the top sectors accounted for 36% of the production and 25% of added value in the Dutch Economy in 2012. Also, 40% of the exports of goods stems from top sector firms, and no less than 88% of R&D expenditure. In addition to the 9 top sectors with their respective top teams, 3 *cross-over domains* have been formulated: ICT, nanotechnology, and BioBased Economy.

In October 2015, the companies, societal organisations, research institutes and governmental authorities united in top sectors signed the new Knowledge and Innovation contract for the next two years.⁵⁶ The *Innovation Contract 2016-2017*, being a continuation of previous agreements, specifies for each top sector which ambitions are set, and which action will be taken to meet the desired goals. Actual collaborative research efforts are largely taking place in the *Top consortia for Knowledge and Innovation (TKIs)*. The TKIs are the coordinating and programming vehicles for carrying out basic and applied research in the nine top sectors. One of their tasks is to allocate TKI-allowance to projects that fit in the roadmaps resulting from the TKI's research programming activities. Like the Innovation Contracts, the TKIs were formed according to a bottom-up process with parties from the government, science and business communities to draw up thematic research and innovation roadmaps. The most recent state of affairs is described in the Monitor Enterprise Policy which was published in October 2015 (for more details, see section 5.7). As noted earlier, it was announced that the number of TKI's will be reduced from 17 to 12 from 2016 onwards.

Compared to its predecessors (notably the innovation programs geared to specific strongholds in the Dutch economy), the Top Sector Policy is more formalized and especially more integrated. The broad scope of the strategy is reflected in the following description of the Top Sector Policy "The principal aim of the top sectors approach – in terms of innovation and research – is to promote closer cooperation between knowledge institutes, businesses and public authorities in the programming of fundamental and applied research, with special attention to the challenges facing society in the near future, including issues relating to sustainability. This will increase the applicability of scientific research for both commercial and social purposes and thus increase the return on the public funds devoted to research. That effect will be enhanced by the fact that the top sector approach incorporates elements of foreign policy, education policy and policies to reduce the administrative burden" (NRP 2013, p. 16). Importantly, rather than focusing on collaborative R&D programs, the new strategy consists of customized policy packages for each of the nine top sectors. The customization also entails that barriers in terms of research, financing, regulation, trade promotion etc. are taken into account. Another feature is that the top sectors themselves are heavily involved in shaping the policies (i.e. they are to a large degree demand-steered by industry) and have to contribute considerably to the specific plans. A third feature, again showing the broadening of innovation policy, is that a clear link is made to human capital formation. For example, all top sectors were asked to develop a human capital agenda (see section 5.3).

⁵⁵ CBS (October 2015). [Top Sector Monitor 2015](#). In Dutch.

⁵⁶ Ministry of Economic Affairs (October 2015). [Knowledge and Innovation contract 2016-2017](#). In Dutch.

2.2 R&I policy initiatives

Detailed descriptions of individual policy measures aimed at supporting innovation are provided in sections 4 and 5 of this report. Here we first discuss which developments have taken place in the domain of innovation and entrepreneurship during the past two years. If anything, 2014 and especially 2015 have seen incremental changes rather than large shifts. Most of the newly launched policy measures fit in the overarching R&I policy and result from an on-going learning process in which the government aims to tailor her interventions to changing socio-economic circumstances.

Although there are relatively many entrepreneurs in the Dutch economy, growth figures in these firms are lagging behind the European averages. In response to this observation, the government (mainly Ministry of EA) presented a programme called '*Ambitious entrepreneurship: an agenda for start-ups and growth*' in March 2014.⁵⁷ This agenda describes how the ecosystem for entrepreneurship is improved by providing firms access to each other, to finance, to innovation and knowledge, and to actors in other countries. Also growth-conducive fiscal conditions and legislation are taken into account. Many of the described interventions are existing measures, but there are also novel initiatives like the *Lead Partnership* (connecting start-ups, government and large firms) and *NLevator* (a platform aimed at creating a network of growth firms).

As a part of the growth agenda, and motivated by studies concerning the (insufficient) capital availability for Dutch SMEs, the EA developed an *Additional Action plan SME funding*.⁵⁸ The plan includes various actions aimed at extending existing measures like the recently established *Netherlands Investment Institute (NLII)* (the ceiling for project funding has been raised). The total package of interventions has the potential of creating €2.5 billion of extra funding. In anticipation of the EFSI ("Juncker Fund"), the Dutch minister of Finance announced the establishment of the Dutch EFSI Investment Agency (NEIA, or NIA).⁵⁹ The Agency will help parties in coming up with a solid proposal for EFSI funds.

One major element of the action plan is the transformed continuation of the *SME Innovation Funds* (Innovatiefonds MKB+). In September 2014 the Ministry of EA started establishing its *Future Fund (Toekomstfonds)*.⁶⁰ The fund contains €200mln of starting capital for innovative start-ups, part of which is taken from gas revenue windfalls. 50% of this capital will be invested in fundamental and applied research, for instance in the form of research facilities and high-risk public-private consortia.

Half of the budget allocated to the Future Fund was made available still in 2014. Within the structure of the original programme SME Innovation Funds, the national government as well as regional development funds created the *Dutch Venture Initiative* (DVI) already in summer 2013. Together with capital of the European Investment Funds (EIF), the DVI initiative helped the government to set up innovation funds jointly possessing over €400mln of venture capital. The venture capital is being invested according to a revolving structure, implying that successful start-ups will have to return all the credit they initially borrowed. Because of the success so far, the government is now willing to continue by introducing DVI II and providing it with €100mln worth of venture capital.

Yet another new support measure for SMEs is the *Early-stage-funds* (Regeling Vroegefasefinanciering, VFF), which was piloted in the northern Dutch provinces during the second half of 2014. The VFF is aimed to help SMEs, innovative start-ups (< 6 year old) or academic spin-offs.

⁵⁷ Ministry of Economic Affairs (March 2014). [Letter on policy for ambitious entrepreneurs](#) (in. In Dutch).

⁵⁸ Ministry of Economic Affairs (February 2015). [Substantially more support for entrepreneurs looking for financial aid](#) (in. In Dutch).

⁵⁹ Ministry of Finance (June 2015). [Agreement EFSI and the establishment of the Dutch EFSI Investment Agency](#).

⁶⁰ Ministry of Economic Affairs (September 2014). [Future fund](#). In Dutch.

In July 2014, the EA announced to make another €50mln available for the national implementation of this measure in the period till 2018 (amounting to €10mln per year on average).⁶¹ Originally launched as a temporal intervention, the VFF will also be made permanent from 2018 onwards. The annual budget is planned to increase to €12,5mln.

Apart from directly providing capital, the government was also enabling alternative forms of funding through credit guarantee schemes like *Qredits* (not receiving any public support anymore from 2015 onwards). The newly established *Subordinated Debt Funds* (Achtergestelde Leningenfondsen, AGL) is supporting private investors to strengthen the equity position of particularly SMEs. The EZ guarantees €500mln of subordinated debt. Furthermore, through the measure for 'Chain funding' (Ketenfinanciering), the EA contributes €5mln to guarantee SME suppliers they will receive payments in time.

In December 2014, an initiative has been set up to make loans available for SMEs. The 'SME Impulse Fund' is meant to help SMEs grow and provides loans of up to €1mln. At this point, one pension fund has invested in the project.⁶² The Ministry of EA, nor any other part of the Dutch government, is not actively involved, but does embrace the initiative.

In March 2014, the government opened the renewed *SME Innovation support for Top Sectors (MIT)*. The measure supports participation of SMEs in all nine top sectors. While the budget in 2013 was only €15mln, this has been doubled in 2014 and topped up with another €1mln by the provinces of Northern-Brabant and Limburg (total: €32mln).⁶³ The finance for doubling the original budget stems from funding originally available for the TKI-allowance, which used to be criticized for being attractive mainly for large incumbents. The Enterprise Policy Monitor 2015 shows that 90% of the 2014 MIT budget has been used for collaborative R&D projects and feasibility studies; the remainder went to network activities, innovation matchmakers, vouchers and 'innovation performance contracts'.⁶⁴ Because the demand for the first two types of support was larger than the MIT instrument could accommodate, it has been extended by also involving regions in the funding of MIT activities.

From 2015 onwards, entrepreneurship is being supported by a 'Special Envoy'.⁶⁵ This ambassador for SMEs and start-ups tries to strengthen the international position of Dutch SMEs. By pointing at the excellent ecosystem for entrepreneurs, the envoy also has the task of attracting (innovative) firms to The Netherlands. Over 2015 a range of support initiatives for the collective of Dutch start-up centres was launched under the label of StartupDelta, such as the introduction of the Startup Visa.⁶⁶ 2015 is the first year StartupDelta is listed in the top 20 of the Global Startup Ecosystem Ranking.⁶⁷

In order to attract *innovative starters from outside of the European Union*, regulations for establishing a business have been relaxed.⁶⁸ This start-up measure allows immigrants to develop a business plan and attract starting capital if they have the potential of contributing to the Dutch economy. After actually establishing a company, entrepreneurs can request a residence permit for two years.

Since January 2014, business can go to one place for all government matters related to doing business: 'Enterprise Square' (in Dutch 'het Ondernemersplein').⁶⁹

⁶¹ Ministry of Economic Affairs (February 2015). [Better chances of growth for enterprises of the future](#) (In Dutch).

⁶² MKB Impuls Fonds (February 2015) [MKB Impulse Fund fills a gap](#) (in. In Dutch).

⁶³ RVO (February 2015) [MKB Innovation Stimulus Top Sectors \(MIT\)](#) (in. In Dutch).

⁶⁴ Ministry of Economic Affairs (October 2015). [Monitor Enterprise Policy](#) 2015. In Dutch.

⁶⁵ Ministry of Finance (September 2014) [Budget Memorandum Day 2014: fortify economic growth](#). In Dutch.

⁶⁶ RVO. [Residence permit for foreign start-ups](#). Accessed on 8-1-2016.

⁶⁷ StartupCompass (August 2015). [Global Ecosystem Ranking 2015](#).

⁶⁸ Ministry of Economic Affairs (February 2015) [Regulations for innovative starters from outside EU](#). In Dutch.

⁶⁹ [Ondernemersplein](#) (February 2015) (in Dutch).

In this one-stop-shop for businesses, services of the Chamber of Commerce, Syntens and parts of the former NL Agency have been combined. In time, services of new parties, such as the taxation authority or municipalities will be included as well. For financial issues, firms can now go to the Chamber of Commerce's central *Finance Desk* ('financieringsdesk').

A little change in the tax reduction schemes for innovation, as announced in the EA's Budget 2015, is that the public institutions will no longer be able to make use of the *tax credit for R&D salaries (WBSO)* when performing contract research. The scheme is particularly aimed at supporting private R&D, which is why the government will no longer provide tax exemptions to public institutes who participate in research projects (of course, various knowledge transfer measures remain available).⁷⁰ From 2016 onwards, the WBSO will be merged with the RDA tax scheme for material R&D expenditures.⁷¹

The Ministry of EA has announced policy experiments with regard to the support of non-technological innovation, i.e. service innovation and social innovation.⁷² This is a follow-up on recommendations by the AWTI⁷³ and findings from the meta-analysis of the policy mix for innovation and entrepreneurship.⁷⁴

In June 2015 the Ministry of EA has described the Cabinet's approach on making laws and regulations "future proof".⁷⁵ This included the intention to create new financial possibilities and more space for innovative entrepreneurship, for instance by giving attention to regulations that hinder innovative entrepreneurs (see section 5.8).

The Smart Industry approach, as introduced in the *Smart Industry* report of 2014 (see next paragraph), has been formalised in an agenda as a part of the top sector policy.⁷⁶ This agenda includes research, valorisation, and implementation of research in business as well as the development of enabling conditions (e.g. privacy, safety and standardization) for an optimal development of a Dutch Smart Industry." In January 2015 the Ministry of EA described in a letter to parliament how it would execute the recommendations made in the Action Agenda.⁷⁷ €100.000 was made available for the next three years. In October 2015, the minister provided a progress rapport on the execution of the Action Agenda.⁷⁸ Also, the minister opened the first of 10 Field Labs aimed at helping manufacturing industries with digitalization.⁷⁹ In line with the overall Enterprise Policy approach, the Field Labs are places - or platforms - where businesses and knowledge institutions can cooperate. The first Field Lab, named Campione, focuses on predicting maintenance issues in the chemical industry by using condition monitoring and big data technologies.

A notable investment in research infrastructures was announced in May 2015. *QuTec*, the Dutch institute for quantum technology, will receive €135 million in the next ten year for the development of quantum computers.⁸⁰

⁷⁰ Ministry of Economic Affairs (July 2015). [Integration fiscal innovation schemes WBSO and RDA](#). In Dutch.

⁷¹ Ministry of Economic Affairs (September 2015). [Budget 2016](#).

⁷² Ministry of Economic Affairs (May 2015). [Policy evaluation Economic Affairs](#). Letter to Parliament 30 991 (23).

⁷³ Ministry of Economic Affairs (July 2015). [Reaction on the AWTI rapports 'Valuing services' and 'The power of social innovation'](#). In Dutch.

⁷⁴ Dialogic (2015). [Evaluation Innovation and Entrepreneurship Policy Mix](#) (article 12/13) 2009-2013.

⁷⁵ Minister of Economic Affairs (July 2015). [Future proof laws and regulation](#). In Dutch.

⁷⁶ Smart Industry (December 2014). [Action Agenda – Smart Industry: Dutch industry fit for the future](#).

⁷⁷ Ministry of EA (January 2015). [Action Agenda Smart Industry](#).

⁷⁸ Ministry of EA (October 2015). [Progress Report Action Agenda Smart Industry](#).

⁷⁹ SmartIndustry (October 2015). [Opening first smart industry Field Lab](#). In Dutch.

⁸⁰ Ministry of Economic Affairs (June 2015). [135mIn euro for development of supercomputers](#).

Also, as agreed upon in the latest innovation contracts (2016-2017), €40mln of additional funding will be made available for ICT-related research and innovation. Sources are NWO (€20mln), TNO (€12mln), and the ministry of EA (€7mln).⁸¹ In October 2015, the Ministry of Infrastructure and Environment also opened a state-of-the-art facility for maritime research.

This is part of a package of €45mln of investments in research infrastructures and innovation projects in the Topsector Water.⁸¹ Finally, to spur e-science and big data technology, NWO and Surf will start a structural investment of €27mln in the Netherlands eScience Center (NLeSC).⁸² Other investments in research infrastructures are described in the RI roadmaps: see section 4.2.2.

As the Dutch R&D&I policy aims to have an integrated scope, most of the relevant developments in the domain of science and education have already been including in the list above. Some additional developments in this domain are worth mentioning separately here.

As for the first two ambitions of the aforementioned Science Vision, the ministry of ECS developed a National Research Agenda together with a large variety of stakeholders.⁸³ The agenda serves four goals: it defines scientific and societal themes corresponding with current or desired strengths of the Dutch economy, it makes connections between existing agendas (in order to spur collaboration across disciplinary and institutional boundaries), it enforces the internationally strong position of Dutch science while involving different parts of the 'knowledge chain' (including those applying knowledge), and it adds to existing research agendas by invoking synergies related to following one single national agenda. The process through which the agenda was drafted, supervised by a 'knowledge coalition' was unique in its extent of public consultation. The mix of addressed stakeholders have submitted 11700 questions they would like to see answered by scientists, some of them having been discussed at one of three major conferences (*Science for Science*, *Science for Competitiveness* and *Science for Society*). In her presentation of the National Research Agenda, the Ministry of ECS described its three key functions: developing it was a *process* creating new interactions, it resulted in a *focus* for future research (the 140 questions finally selected are categorized into: Human, environment and economy, Individual and society, Diseases and health, Technology and society, and Building blocks of life), and it is regarded as an *instrument* for knowledge diffusion and collaboration in itself.

One notable (financial) reform in the context of education concerns a considerable revision of the Dutch study grant system by the Ministry of Education, Culture and Science. From September 2015 onwards students no longer have a basic study grant anymore. Instead, they can make use of an extended loan system. By offering study loans under favourable conditions, the government is able to reduce its spending substantially. These contested plans have been under discussion for several years, but were finally accepted by parliament in January 2015. The budget that is freed up through this considerable change was estimated to amount up to about €1 billion and will (according to the ministry) be invested in raising quality of higher education, e.g. by more intense training of students, more contact hours, extra budget for excellent scientist providing education.⁸⁴ As a result of the major reform of the study allowance, €620mln more will be available for augmenting education quality.⁸⁵

Another attempt to focus more on talent and excellence is captured by revisions in the new Standard Evaluation Protocol (also described in section 2.7). Also, contribution to societal challenges has become a key criterion for achieving research funding.

⁸¹ Ministry of Economic Affairs (October 2015). [Topsectors: more innovation, extra investments in ICT](#). In Dutch.

⁸² ScienceGuide (October 2015). [Large impulse for eScience and Big Data](#). In Dutch.

⁸³ Ministry of Education, Culture and Science (November 2015). [National Research Agenda](#). In Dutch.

⁸⁴ Ministry of Education, Culture and Science (February 2015) [Changes student financial aid](#). In Dutch.

⁸⁵ VSNU (June 2015). [Factsheet revenues study allowance](#). In Dutch.

Before the establishment of the triple helix *Top consortia for Knowledge and Innovation* (TKIs), a significant share of public research was performed in Technological Top Institutes (TTIs). Despite being successful in bringing about strong research results, the TTIs were found to be insufficiently embedded in the general knowledge infrastructure in the Dutch innovation system.

Over the past years, support for TTIs has made place for support for TKIs. By merging three TKIs into one consortium for Chemistry, the number of TKIs lies at 17 in 2015. Further consolidation will result in a total of 12 TKI's by 2016. The TKI-allowance policy is currently being simplified by, for instance, ensuring that no other regulation for public-private partnerships (PPP) is required than imposed by the EC's state aid framework for innovation, by providing a subsidy for TKIs to organize themselves better, and by attempting to reduce administrative burdens when multiple sources of public funding are used for the same PPP research project.

The Ministry of ECS announced in its Budget 2016 that it will increase the capital available for *matching research funds* from the European Commission's research framework Horizon2020. Several of these funds require the Dutch government to contribute a part as well. Given the success of Dutch researchers in attracting European research funds from F7 (see section 3.3), the available matching budget has been raised with €50mIn.⁸⁶

2.2.1 Evaluations, consultations, foresight exercises

Evaluation

Taking into account the recommendations by the commission Theeuwes in her report *Dare to measure*' (November 2012)²⁸, the Dutch government has developed an extensive evaluation system for tracking the effectiveness of its Enterprise Policy from the first moment on. This system includes, amongst others the yearly publication of monitors in which a variety of statistical indicators are reported. These are the *Monitor Top Sectors* (by CBS / Statistics Netherlands)⁵⁵ and the *Monitor Enterprise Policy* (by EA)⁸⁷. The latest versions have been published in October 2015. The monitors are also complemented with a *Progress Report* ('Voortgangsrappportages') the EA releases almost simultaneously. In the Progress Report of October 2015²⁶, called 'Collaboration for Renewal', the latest state of affairs and updates are listed (see section 2.2 for discussion of policy developments).

With respect to the top sectors, the EA has asked the AWTI to advise annually on how to give direction to this element of the Enterprise Policy. After providing a number of suggestions in September 2013 (to which the EA responded in its 2013 Progress Report), and publishing a follow-up in October 2014⁸⁸, the latest '*Balance of Top Sectors*' was released in October 2015.⁸⁹ The AWTI praises the increase of the MIT-budget, the involvement of regional authorities and HEI's, and the increase in the number of SMEs participating in public-private research collaborations. Although stressing the importance of continuity, the AWTI does note some possibilities for improvement. The council states that funding schemes are ill-equipped for providing finance to cross-sectoral research themes, as R&I programs tend to be organized around individual sectors rather than, for instance, societal challenges. Another criticism is that the TKI-allowance is insufficiently attractive (and its budget too fragmented) to effectively spur private R&D investments. Business participation in TKI research could arguably be much higher if the instrument was less complex. A more elaborated advice will follow in 2016.

⁸⁶ Ministry of Education, Culture and Science (February 2015). [€50 million for Dutch knowledge institutes when retrieving European research fund](#). In Dutch.

⁸⁷ Ministry of Economic Affairs (October 2015). [Monitor Enterprise Policy 2015](#). In Dutch.

⁸⁸ AWTI (October 2014) Top Sector Balance ('[Balans van de Top Sectoren](#)') 2014. In Dutch.

⁸⁹ AWTI (October 2015) Top Sector Balance ('[Balans van de Top Sectoren](#)') 2015. (In Dutch).

Another foresight study is the '*Smart Industry*' report (April 2014), which clarifies how the fourth industrial revolution is of relevance for companies, knowledge institutions, and government in the Netherlands.⁹⁰ Smart Industry is an initiative by TNO (institute for applied research), the Ministry of Economic Affairs, the Chambers of Commerce, as well as VNO-NCW and FME (major employer associations).

The motivation to unite frontrunners is that the Dutch business community is believed to be in an excellent position to gain a strong position in trends like the Internet-of-Things. The report also explains how Smart Industry relates to the top sectors: "Smart Industry should be a cross-cutting theme within the top sector policy in which a broad coalition of companies, knowledge institutions and government should be involved.

A notable publication dating from 2015 is the meta-evaluation of in total 65 mostly financial instruments that are part of policy articles 12 (innovation) and 13 (entrepreneurship/ entrepreneurial climate) on the budget of the Ministry of EA.⁹¹ This mandatory meta-evaluation is used for reflecting on the current policy mix and to start a discussion on whether changes in the policy mix are needed. Also the Innovation box has recently been evaluated (see section 3.5.2)

Looking at systems for evaluating science on a structural basis, the new *Standard Evaluation Protocol 2015-2021* was published in March 2014 by the VSNU (Association of universities in the Netherlands), NWO and the KNAW.⁹² As the protocol states in its introduction: "The Standard Evaluation Protocol (SEP) describes the methods used to assess research conducted at Dutch universities and NWO and Academy institutes every six years, as well as the aims of such assessments" (p. 4). In the latest version, specific attention is paid to the integrity of scientific research. Another change is that productivity is no longer a criterion; the main categories for research assessment are now research quality, relevance to society and viability. The quality of Dutch education is being assessed by the ECS' Education Inspectorate. The inspectorate is responsible for inspection and review of schools and educational institutions. Each year, it publishes its findings in 'The State of Education in the Netherlands'. The latest one, reflecting upon the years 2013/2014, dates from August 2015.⁹³ This report does not cover higher education, however. Those are typically assessed in international comparisons, like the Times Higher Education Ranking (in which the Dutch universities perform only moderately when it comes to education). The Rathenau Institute for research and dialogue on STI-subjects annually presents an overview of Total Investment in Research and Innovation (TWIN).⁹⁴

A thorough screening somewhat similar to the one described for innovation and entrepreneurship has recently been performed for the Dutch science system as well. An interdepartmental working group, led by the Ministry of Finance, conducted the *Interdepartmental Policy Study* ('*IBO Wetenschappelijk onderzoek*') that was published in May 2014. Main objective of the IBO was to determine whether the science system is future proof, and on what accounts policy changes are required. In order to make such recommendations, the science system has been assessed on four goals: creating possibilities for performing curiosity-driven research, yielding economic output, yielding societal output, and possibilities to perform education-oriented research.

⁹⁰ Smart Industry (July 2014) [Smart Industry: Dutch industry fit for the future](#).

⁹¹ Dialogic (May 2015). [Evaluation Innovation and Entrepreneurship Policy Mix](#) (article 12/13) 2009-2013. In Dutch.

⁹² VSNU/NWO/KNAW (2014) [Standard Evaluation Protocol \(SEP\): Protocol for research assessments in the Netherlands](#).

⁹³ Ministry of Education Culture & Science's Education Inspectorate (2014). [The state of education in the Netherlands](#).

⁹⁴ For the latest report: Rathenau Institute (April 2015). [Total Investment in Research and Innovation 2014-2020](#).

Consultations and foresight studies

Several relevant consultations and foresight studies have been published in the recent past:

- WUR, TNO and STW, as well as the Technical Universities Delft, Eindhoven and Twente published an [Agenda for the Netherlands](#). The agenda adds to the National Research Agenda by describing ten themes on which R&D&I efforts should be focused on.
- In July 2015, the Association of Universities VSNU presented their Strategic Vision on academic education in the future: [Good morning professor. Vision on education in a new era](#). It underlines small-scale, intensive, flexible education with more lecturers per student. Earlier also the Netherlands Association of Universities of Applied Sciences presented her strategic vision [Higher education and research in the Netherlands 2015](#).
- The Social-Economic Council (SER) published [Agenda for the City](#), an advice report highlighting differentiation and cooperation between cities, as well as the need for the development of talent and entrepreneurship.
- Holland High Tech, the Top Sector top team for high tech materials, published the [Holland High Tech Vision Document 2025](#), which will be used as input for the Vision Document Top Sectors 2025. It prioritizes public-private cooperation and more investments in R&D.
- The Rathenau Institute presented an e-publication with tips and examples regarding valorization, named [Valorisation: researchers are already doing more than they think](#).
- The AWTI published an advice to renew the relationship between higher education and research: [Interweaving of research and higher education. Unity in diversity](#). The AWTI presented an advice on the future role of ICT in the Dutch economy, called [Ready for the future](#). It recommends a better integrated ICT policy.

2.3 European Semester 2014 and 2015

While the last European Semester's Country Reports do appreciate budget reforms and resulting deficit reductions realized in the past few years, the Dutch government is recommended not to save on growth-related expenditures. Education and research are regarded as important pillars under the future prosperity of the economy. In reaction to these Country Reports, the Dutch government is trying to enhance the 'earning capacity' of the Netherlands together with companies, knowledge institutes and other governments. The NRP 2014 and 2015 mention several measures aimed at strengthening the domains of research and education. The goal of many of the innovation instruments is to use public investments as a lever for private investments, as especially these are lacking behind. An important measure in this respect is the establishment of the TKI's, in which research projects only take place if private parties contribute funding as well. Research projects performed in the TKI's in 2014 had a total value of €900mIn, as compared to €620mIn one year earlier.⁹⁵ Private contributions accounted for 35%. According to the latest EA reports this number is now up to 44%.⁹⁶ Also the large tax schemes are based on a model in which the government does not simply provide subsidies (with the risk of having minor private matching): firms can benefit from innovation based tax deduction only when they actually have innovation expenditures.

⁹⁵ Ministry of Economic Affairs (October 2015). [Monitor Enterprise Policy 2015](#). In Dutch.

⁹⁶ Ministry of Economic Affairs (October 2015). [Monitor Enterprise Policy 2015](#). In Dutch

Apart from protecting or even intensifying efforts to accelerate private R&I expenditure, the Dutch government is also investing heavily in education. On top of the €600mIn (0.1% of GDP) that was reserved for these purposes in the coalition agreement, another €600mIn was added in the recent ECS budget.⁹⁷

As a result of the major reform of the study allowance, €620mIn more will eventually be available for augmenting education quality (not exclusively higher education). Also the publication of the Science Vision 2025 (November 2014) is a promising start for improving science and education, just like the formulation of a National Research Agenda.

Most of the measures listed in the NRP's have been implemented already. The European Semester's Country Specific Recommendations for 2015 (CSR) are positive about the budget consolidation measures, but repeat the concern that the Netherlands are not on track with respect to the goal of a GERD of 2.5%.⁹⁸ The CSR state that additional efforts will be needed. According to the NRP 2015, some of the measures on this account are of recent date only, like the SME+ Innovation Fund, the Dutch Venture Initiative, the MIT and the IPCs within the Top Sectors, and resources for the matching requirements in Horizon2020 projects. Although targeting R&I activities in a wide range of firms, it should be noted that total government expenditure on R&D is not increasing. This implies that the desired 0.5% growth in R&D expenditures mainly has to come from measures more effectively targeted at private expenditures or from attracting foreign funds. At this point, it is too early to state whether the proposed interventions and their budgets will be sufficient.

2.4 National and Regional R&I Strategies on Smart Specialisation

In the Netherlands a Research and Innovations Strategy for Smart Specialisation (RIS3) has been developed for four separate regions Noord-Nederland, Oost-Nederland, Zuid-Nederland and West-Nederland (North, East, South, West). The RIS3 strategy of each region is discussed separately in this section and is based on updates of the information originally provided in the ERAC Infopaper of 2014.⁹⁹ The RIS3 were developed as a part of the ERDF program to the European Commission. All four strategies are currently being executed. Because the strategies focus on specific Topsectors (and thus TKIs), they are automatically connected to national R&I policies and available research infrastructures. The RIS3 programs are predominantly strategic in nature, not (publically) including a detailed financial plan. Proposed interventions typically focus on collaboration and human capital, rather than on (co-)funding for private investment.

Noord-Nederland

The RIS3 strategy of Noord-Nederland is developed by the Northern Netherlands Provinces alliance (SNN).¹⁰⁰ It is the leading document for innovation policy in the three participating provinces. Four key societal challenges are distinguished: 1) health and demographics, (2) food security, sustainable agriculture and bio-based economy, (3) reliable, clean and efficient energy and (4) clean and reliable water supply. In the RIS3 strategy the challenges are linked to several strong regional clusters, active in the field of energy, water, agribusiness, healthy ageing and sensors. In order to solve societal challenges, firms and knowledge institutes related to the strong clusters are invited to participate in 'living labs'; situations open for experimentation with innovative approaches to the issues a particular area is struggling with.

⁹⁷ Ministry of Economic Affairs (July 2015). [Integration fiscal innovation schemes WBSO and RDA](#). In Dutch.

⁹⁸ Ministry of Economic Affairs (March 2015). [National Reform Programme. The Netherlands 2015](#).

⁹⁹ Van den Broeck (April 2014). [Smart specialization in the Netherlands: the story so far](#). ERAC. In Dutch.

¹⁰⁰ SNN. [Innovatiestrategie Noord-Nederland \(RIS3\)](#). In Dutch.

Important in this respect is the cross-over approach propagated in the RIS3-strategy, which acknowledges the potential strategies emerging when firms from different clusters collaborate with each other (apart from with public R&I institutes).

Oost-Nederland

The region Oost-Nederland has identified four focal points: Agro & Food, Health, High Tech Systems and Materials (HTSM) and Energy- and Environmental Technology and the Biobased Economy (EET). The centre of the Agro & Food sector can be found in the Food Valley around Wageningen. This small geographic area is hosting leading institutes and a large number of firms active in the Agro & Food sector. For the Health sector three relevant areas are identified: Health Valley Nijmegen, Health region Zwolle and the Center for Medical Imaging in Enschede.

The HTSM sector can be distinguished in five campuses: Kennispark Twente, Mercator Science Park, Noviotech Campus, Polymer Science Park and the Thales High Tech Campus. The most important campus is Kennispark Twente. The EET sector does not have any clusters and can be found throughout the whole region. In Oost-Nederland the RIS3 is not an important part of the policy agenda for the responsible governments. Each of the provinces in the regions (Gelderland and Overijssel) has his own economic agenda; the RIS3 is only used for European projects. The RIS3 does include however some minor measures to stimulate private investments, such as fiscal measures, regional development agencies and innovation contracts.

Zuid-Nederland

The region Zuid-Nederland has identified four local clusters and three cross-border clusters (the region refers to them as 'national' and 'international'). The local clusters that can be distinguished are Life Sciences & Health, Biobased, Logistics and Maintenance. The cross-border clusters are High Tech Systems and Materials (HTSM), Chemical industry and Agrofood & Horticulture and Starting Materials (AHS). The HTSM cluster can be found in the Eindhoven area, while the Chemical industry is present around Chemelot (Limburg area) and in West-Brabant and Zeeland. The AHS cluster is strong in Oost-Brabant and Noord-Limburg. Several campuses can be distinguished within these clusters such as the High Tech Campus in Eindhoven and the Chemelot campus in Sittard-Geleen. The RIS3 originated from the Brainport 2020 agenda, which is the leading regional innovation agenda for Zuid-Nederland. A new (or rather reinvigorated) research program, OPZuid, has made available €321mIn for supporting SMEs in the region in the following years. The program, receiving funding from the European Union, the Dutch government and the provinces of Brabant, Zeeland and Limburg, aims to strengthen the region by fostering innovation in the main competence areas.¹⁰¹

West-Nederland

The Research and Innovation Strategy of the region West-Nederland is based on the Economic priority areas. These priority areas are Agri & Food, Chemistry, Creative Industry, Sustainable Energy, High Tech, Logistics, Life Sciences & health, Horticulture & Propagation Materials and Water and Climate. In each priority area two themes are important: knowledge valorization and sustainability. Furthermore, spillovers between the different Economic priority areas are also deemed relevant. Similar to Oost-Nederland, the RIS3 is not an important part of the policy agenda for the responsible governments in West-Nederland. They already have multiple innovation agenda's such as Zuidvleugel Agenda en de Kennis- en Innovatie agenda Metropoolregio Amsterdam.

¹⁰¹ Omroep Brabant (February 2015) [321 million for innovation in South-Netherlands](#) (in. In Dutch).

Monitoring

The four regions agreed to perform a nationwide monitor of the RIS3. The monitor is done by the Dutch Bureau of Statistics (CBS). The RIS3 monitor is incorporated as a part of the Economic priority area monitor which is performed every two years. It consists of several quantitative indicators such as private R&D expenses, amount of innovative firms, expenses with regard to innovation and the amount of cooperation taking place with research facilities. The indicators are measures by the Innovation and R&D survey and Community Innovation survey (CIS-survey).¹⁰² The first RIS3 monitor, based on 2014 data, is scheduled for Q2/3 2016.¹⁰³

2.5 Main policy changes in the last five years

The table below lists the main institutional developments in the Dutch R&I system. Most of them are discussed throughout this report. In summary, the installation of the Cabinet Rutte I (and later Rutte II) has led to a make-over of a part of the policy mix for research and innovation. Being introduced by both Ministries of Economic Affairs (EA) as well as Education, Culture and Science (ECS), the new 'Enterprise Policy' intensifies the connection between R&D, innovation and entrepreneurship on the one hand, and science and education on the other hand. Over the past five years, this resulted in the formation of Top Teams (corresponding with the Top Sectors selected by the government) and the Top consortia for Knowledge and Innovation. Since 2011, also more than 60 Centres of Expertise or Innovative Craftsmanship have been established. Recent years are marked by institutional developments in the form of mergers between agencies or other institutes, mostly for reasons of clarity and reduction of administrative costs. For instance, this includes the emergence of the Netherlands Enterprise Agency ('RvO')¹⁰⁴ and the Enterprise Square ('Ondernemersplein').¹⁰⁵ As part of the Enterprise Policy, top teams every year sign Knowledge and Innovation contracts in which they commit themselves to research efforts on particular themes.

Apart from developments related to implementation of the Enterprise Policy, both EA and ECS have been executing several changes by themselves as well. In the domain of economy, an ongoing development is the continuous attempts to improve impact measurement. Following the example of the Innovation Growth Lab in the UK, the Ministry of EA announced it will try to implement policy experiments designed according to a randomized controlled trial.¹⁰⁶ The topic of this first experiment will be non-technological innovation (see section 2.2.). Also, the ministry increasingly considers removal of legal barriers as an important means to spur innovation and to make the Netherlands attractive for R&D and experiments by companies from abroad (see section 5.5).¹⁰⁷ For the Ministry of ECS, a trajectory of major importance is the publication of a new [Strategic Agenda for Higher Education and Research 2015-2025](#)¹⁰⁸ (based on the Science Vision 2025), as well as the [National Research Agenda](#) of November 2015.¹⁰⁹ A related development, also coming forth out of the Science Vision 2025, is the reorganisation of NWO.¹¹⁰ Although the contours have been designed already and a new multi-annual strategy has been presented, the transformation is expected to be completed not before 2017 (see section 3.4).

¹⁰² Opportunities for the West (2014). [RIS3 Smart Specialisation Strategy Netherlands-West](#). In Dutch.

¹⁰³ Source: correspondence with Statistics Netherlands (CBS), December 2015.

¹⁰⁴ The main actor for implementing innovation schemes, see the extensive website <http://english.rvo.nl/>.

¹⁰⁵ For the central digital entry see <http://www.kvk.nl/english/>.

¹⁰⁶ Ministry of Economic Affairs (May 2015). [Policy evaluation Economic Affairs](#). Letter to Parliament 30 991 (23).

¹⁰⁷ Maarten Camps (January 2015). [Sturen op de toekomst](#). ESB. In Dutch.

¹⁰⁸ Ministry of Education, Culture and Science (July 2015). [The value\(s\) of knowing: Strategic Agenda Higher Education and Research 2015-2025](#). In Dutch.

¹⁰⁹ Ministries of ECS and EA (November 2015). [National Research Agenda](#). Letter to Parliament.

¹¹⁰ See [Science Vision 2025](#), and in particular the attachment '[Van lappendeken naar een nationaal discours en centrale programmering](#)' (in Dutch).

Main changes in 2011

Introduction of the new Enterprise Policy: To the Top, including identification of 9 Top Sectors

Formation of Top Teams, representing the Top Sectors

Creation of first Centres of Expertise / Centres for Innovative Craftsmanship

Ministry of ESC presents strategic agenda 'Quality in Diversity'

Foundation of National Commission of Valorisation ('Landelijke Commissie Valorisatie', LCV)

TO2 brought under the ministry of Economic Affairs

Main changes in 2012

Installation of Cabinet Rutte II

Top teams established 19 Top consortia for Knowledge and Innovation (TKIs)

Introduction of the fiscal scheme RDA

Ministry of ECS and universities sign performance agreements for the period 2012-2015

Main Changes in 2013

Top teams sign 'Innovation Contracts 2014-2015' with Ministry of Economic Affairs

The MIT instrument became operational

Main changes in 2014

Merger of Syntens and Chambers of Commerce into Enterprise Square ('Ondernemersplein'), AWT and General Energy Council fuse into AWTI (Advisory Council for Science, Technology and Innovation)

Knowledge and Innovation contracts 2015-2016

NL Agency merges with the agency for regulations ('Dienst regelingen') into Netherlands Enterprise Agency ('RvO.nl')

TNO and Large Technological Institutes (GTIs), together the TO2 federation, present joint strategic agenda

Ministry of ESC presents Science Vision 2025

Main changes in 2015

Knowledge and Innovation contracts 2016-2017

Policy experiment (non-technological innovation) announced

Enhanced focus on removing (legal) barriers for innovation, e.g. by StartupDelta

Publication of Strategic Agenda Higher Education and Research 2015-2025 (July 2015) and

National Research Agenda (November 2015)

New strategy / reorganisation of NWO

3. Public and private funding of R&I and expenditure

3.1 Introduction

Although presented as signs of progress in the Dutch NRP 2015, expenditures on Research and Development (GERD) as a share of GDP have been increasing only gradually over the past few years. The 1.97% of GDP measured in 2014 is similar to the EU28 average, but well below the national target of 2.5%. Given the high rate of GDP per capita (discussed in section 1.1), also GERD as expressed by euro per capita is above the European average.

According to Table 2, and as mentioned repeatedly throughout this country report and its predecessors, particularly concerning in the Dutch R&I profile are the R&D expenditures funded by the business sector (BERD). This amount to 1.02% of GDP in 2014, as compared to a EU28 average of 1.12% (2013). In the past Innovation Union Scoreboards, this has consistently been the main indicator where the Netherlands are underperforming. Expressed as a percentage of GERD, Dutch business-funded R&D lays around 52% versus a EU28 average of 55%. When looking at who performed R&D (rather than who funded it), Dutch businesses expenditures of 1.11% of GDP account for 56% of the total R&D expenditures versus a European average of 64% (2014). A low share of private R&D is complemented with a high share of R&D being performed by higher education institutions (HEIs). The share of 32% of GERD exceeds the European average of 23%. Finally, R&D performed by governmental research organizations has been constant over the past years (11%-11.6% of GERD). Because the most severe fiscal consolidations were implemented in 2014, it is too early to assess the effect this had on the amount and relative distribution of R&D investments. The same holds for interventions introduced with the Enterprise Policy, aimed at leveraging business R&D expenditure.

Compared to other countries, the Netherlands have been fairly successful in obtaining funding from the European Framework Programs for research and technological development (RTD). The 5113 FP7-projects that were awarded with in total €3.37bln delivered funding to no less than 8280 participants.¹¹¹ With a return of 8.3% of total funding, exceeding the initial contribution of 5%, the Netherlands have been exceptionally successful in attracting FP7-funding. Especially important for this result were the technological institutes and universities. The participation of SMEs (receiving 13% of attracted funding) was below the European average of 15%. In the first call of the Horizon2020 'SME instrument', Dutch SMEs have been underperforming with a hit rate of 4% for phase 1 projects (compared to the EU average of 6%). This number has steadily going up in later calls and phase 2, however. The hit rate in the first two calls of phase 2 was 16.5% on average; significantly higher than the EU average of 11.5%.¹¹² To maintain or even enhance this performance level and exploitation of the research projects receiving European funding, the cabinet introduced a 'fast track to innovation' and a SME-instrument (MIT) in 2015.¹¹³

In the period 2007-2013, the Netherlands received €830mln out of the €201bln of European structural funds (ERDF). As the total available amount for 2014-2020 is lower (€183bln), also funding for Dutch regions will decrease. The €500mln expected by RVO.nl would correspond with a lower relative share for the Netherlands (0.27% instead of 0.41%).¹¹⁴

¹¹¹ Joint Research Centre – Institute for Prospective Technological Studies (2015). Internal documents.

¹¹² Ministry of Economic Affairs (May 2015). [Positive developments in the participation of Dutch SMEs in Horizon 2020](#).

¹¹³ Ministry of Economic Affairs (2014). [Progress Report Enterprise Policy 2014](#).

¹¹⁴ RVO.nl. [Europees Fonds voor Regionale Ontwikkeling \(EFRO\)](#). In Dutch. Accessed on 9-1-2016.

Table 2: Basic indicators for R&D investments

Indicator	2011	2012	2013	2014	2015	EU average (2014)*
GERD (as % of GDP)	1.9	1.94	1.96	1.97		2.03
GERD (Euro per capita)	734.6	747.9	759.5	776.9		558.4
GBAORD (€m)	4975.06	4676.81	4794.3	4924.47	4779.68	92828.15
R&D funded by GOV (% of GDP)	0.65	0.63	0.65	0.65		0.66
R&D funded by BES (% of GDP)	0.97	1	1	1.02		1.12
R&D funded by PNP (% of GDP)	0.06	0.06	0.06	0.06		0.03
R&D funded from abroad	0.22	0.24	0.24	0.25		0.2
R&D performed by government sector (% of GDP)	0.21	0.23	0.24	0.23		0.25
R&D performed by business sector (% of GDP)	1.08	1.1	1.09	1.11		1.3
R&D performed by HEIs (% of GDP)	0.62	0.61	0.63	0.64		0.47

* EU28-averages of R&D funding concern 2013 figures.

3.2 Smart fiscal consolidation

3.2.1 Economic Growth, fiscal context and public R&D

Following a contraction in real GDP in 2012 and 2013, the Dutch economy returned to growth in 2014 (1.0%) and 2015 (1.9%) driven by domestic demand as a result of real wage growth and improving labour market conditions. The Commission forecasts 2.1% growth in 2016 and 2.3% in 2017^{115, 116}.

Public finances were strongly hit by the crisis: the headline deficit jumped to more than 5% of GDP in 2009 from the previous levels which were in balance or showed a slight surplus (Figure 2). This has been followed by gradual and continuous decreases down to 2.2% by 2015 thanks to a robust multiannual fiscal framework that uses inflation-adjusted expenditure ceilings predetermined for the entire term of office of the government, automatic stabilisers on the revenue side and independently derived macroeconomic assumptions.

¹¹⁵ As a legacy of the credit-led housing boom that started in the 1990s, Dutch households remain highly indebted. The on-going deleveraging by households is likely to put a limit on the speed of economic recovery http://ec.europa.eu/europe2020/pdf/csr2015/cr2015_netherlands_en.pdf.

¹¹⁶ As a legacy of the credit-led housing boom that started in the 1990s, Dutch households remain highly indebted. The on-going deleveraging by households is likely to put a limit on the speed of economic recovery http://ec.europa.eu/europe2020/pdf/csr2015/cr2015_netherlands_en.pdf.

In 2016-17 it is expected to continue to improve to 1.8% and 1.5% of GDP, respectively due mainly to the recovery of domestic demand leading to higher tax income.

The gross government debt increased gradually from the pre-crisis levels of 43-50% to around 66-68% by 2014-2015, a level from where it is expected to decrease to ca. 65% by 2017 thanks to increasing nominal GDP and to the sale of financial assets and other debt-reducing measures. The country seems to face medium and long-term fiscal sustainability risks due to ageing related costs.

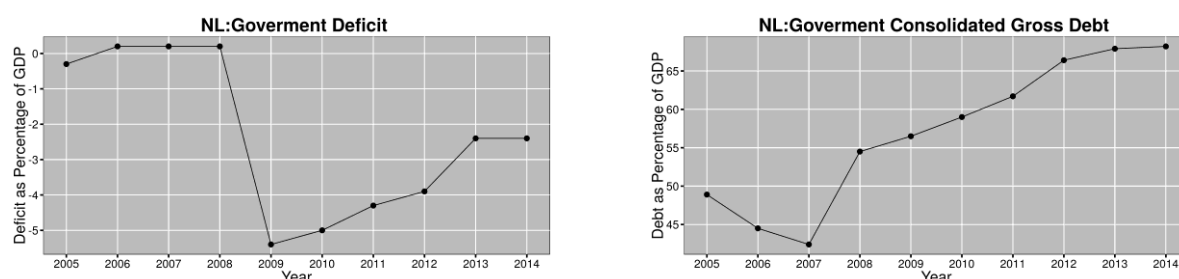


Figure 2: Government deficit and public debt

Data source: Eurostat

Total GERD in the Netherlands was 12,743 MEUR in 2013. There are three main sources of R&D funding: the business sector (6,0516 MEUR), the government (4,249 MEUR), and foreign funding (1,551 MEUR). Direct funding from the government goes to business enterprises (118 MEUR), the government (910 MEUR) and the higher education sector (3,250 MEUR).¹¹⁷

Table 3: Key Dutch Public R&D Indicators

	2007	2009	2013
GBAORD, % of gov. exp.	1.61	1.54	1.49
GERD, % of GDP	1.69	1.69	1.96
out of which GERD to public, % of GDP	0.80	0.89	0.87
Funding from GOV to, % of GDP			
Business	0.02	0.03	0.02
Public (GOV+HES)	0.60	0.66	0.63
Total	0.64	0.69	0.65
EU funding, % of GDP	n.a.	n.a.	0.03

Source: Eurostat

¹¹⁷ National sources indicate that government funding of R&D was 4278 in 2014. Funding from Business and private non profit combined had increased more substantially to 7143 MEUR in 2014. Total GERD had increased to 13075 MEUR (<http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=82042NED>).

3.2.2 Direct Funding of R&D activities

Figure 3, below shows the historical evolution of GERD financing in current prices in the Netherlands.¹¹⁸

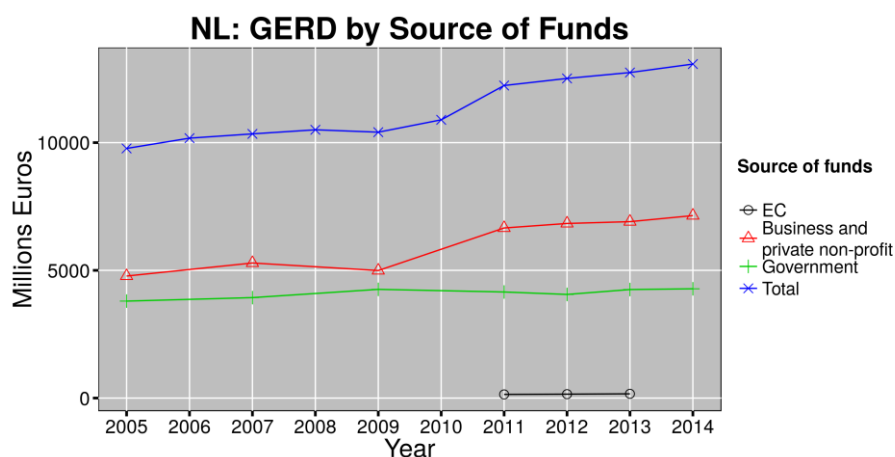


Figure 3: Funding of the total GERD

Data source: Eurostat

Figure 3 shows that the total R&D expenditure in Netherlands increased between 2010 and 2013 due to an increase in the R&D investments of the private sector. Direct public funding has remained almost stable, whereas the available data from Eurostat is not sufficient to assess the effect of the EC contribution.

"The jump in Business financed R&D expenditure occurring in 2011 can partially be attributed to revisions in the measurement procedure (definitions and inclusion of firms with a size of 1 – 9 employees)¹¹⁹, as well as to temporary crisis measures implemented in 2010"¹²⁰. Nevertheless, R&D intensity continued increasing and in 2013 reached 1.98% of GDP, approaching the EU28 average of 2.01%.

3.2.2.1 Direct public funding from the government

The analysis of the total civil R&D appropriations in millions of euro shows an increasing trend in the period 2005-2011. The peak in 2011 can be attributed to temporary crisis related measures implemented in 2010. Only in 2012 we see a significant drop in GBAORD, which could be due to the shift from subsidies to R&D tax incentives by the Cabinet Rutte. Later this shift was followed by the introduction of some new budgets for the Ministry of ECS and in particular NWO. The drop did not continue in 2013 and 2014 but it was repeated in 2015 though at a lower rate. One also notices that the difference between the total and the civil appropriations remains approximately constant in the whole period under study: The defence R&D budget is small but stable.

¹¹⁸ The sources of R&D funding according to the Frascati manual are: Government sector (GOV), Higher education sector (HES), Private non-profit sector (PNP) and Abroad (including EC). In this analysis the public sector as source of funds is given by the Government sector (GOV), whereas the public sector as a sector of performance is the aggregation of GOV and Higher education sector (HES).

¹¹⁹ Eurostat indicates a break in the series in 2011.

¹²⁰ Pim den Hertog, Matthijs Jansen, RIO country report 2014 the Netherlands, draft version.

The GERD funded by government in nominal terms increases from 2005 to 2009, not always at the same rate. It drops in 2011 and 2012 (data for 2010 is not available) but increases again in 2013, following a similar pattern as the budget appropriations. The EC contribution increased from 144 to 162 million euro between 2011 and 2012.

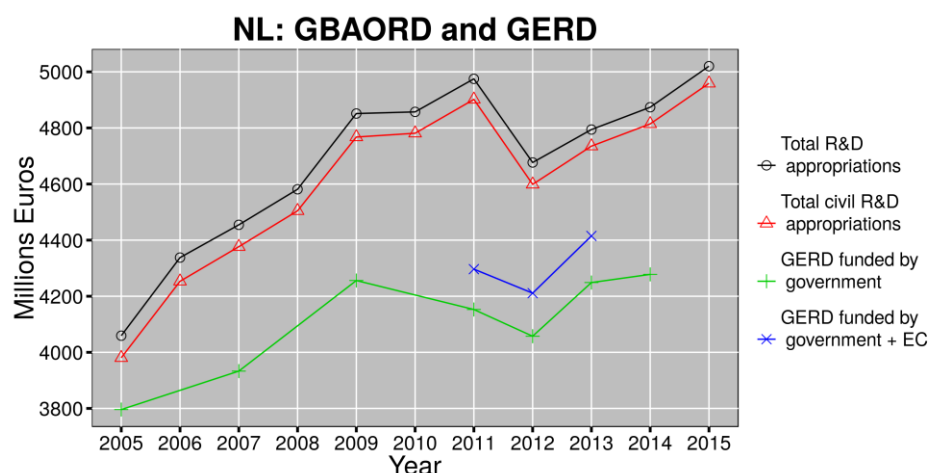


Figure 4: R&D appropriations and government funded GERD in millions of national currency

Data source: Eurostat

3.2.2.2 Direct public funding from abroad

It is clear from the figures for 2011 to 2013 that the contribution of the EC as share of GOVERD is increasing over time.

Table 4: Public Funding from Abroad to Dutch R&D (in millions of national currency)

Source from abroad	2005	2007	2009	2011	2012	2013	2014
Total	1173	1102	1129	1385.40	1566.91	1551.13	1632.78
BES				943.53	1078.74	1033.40	
EC				143.90	153.57	166.17	
HES				29.85	37.31	26.48	
International Organizations				268.12	297.29	325.08	
Total as % GERD	12	10.66	10.85	11.32	12.52	12.17	12.49
EC as % GOVERD				3.47	3.78	3.91	

Table 4 shows that the overall EC contribution to the R&D funding from Abroad has increased over the years but the largest part comes from the private sector.¹²¹

¹²¹ National sources indicate that in 2014 the total funding from abroad had increased to 1633 MEUR.

<http://www.cbs.nl/nl-NL/menu/themas/bedrijven/publicaties/artikelen/archief/2015/2015-meer-onderzoek-en-innovatie-bij-nederlandse-bedrijven.htm>

The EC contribution as reported by Eurostat seems small but increasing (3.91%% of the direct public support to R&D in 2013). In reality the Netherlands receives a considerably larger amount of funding for R&D from EC sources.

The Netherlands is one of the largest net recipients of FP7 funding, having received 3.371 bn euro in funding over the FP7 period, which corresponds to 8.3% of the overall EC financial contribution to EU28.¹²² It is interesting to note that the corresponding rate for FP6 for Netherlands was 7.6% which clearly indicates that the Netherlands became more competitive over the FP7 period.

Van Steen indicates that over the last fifteen year the average annual income from FPs has increased from 165 million to 475 million euro.¹²³ Moreover, FP7 funding out-weights the contributions received as core R&D funding through the structural funds (around 180 million euro¹²⁴). This amount is significant if one considers that government funding in each year between 2007 and 2014 remains below 4.5 bn euro. For 2014, Van Steen estimates the share of FP and structural funding to be [just] below 10% of the national public expenditure for R&D and innovation.

Distribution of public funding

Figure 5, below shows how the distribution of public funding to sectors of performance evolved over time:

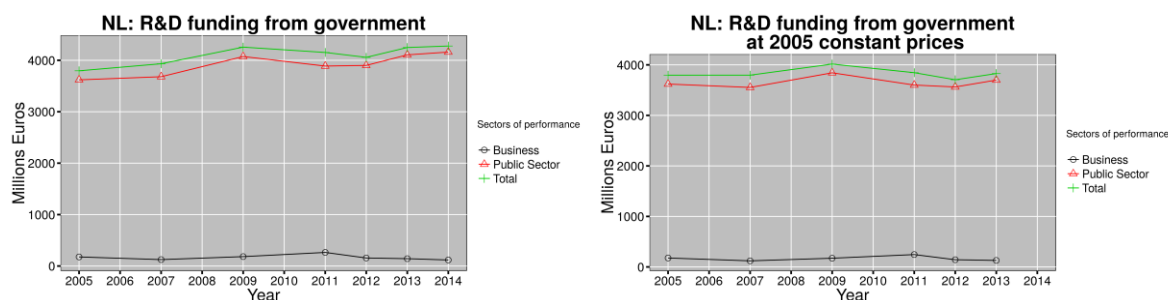


Figure 5: Government intramural expenditure by sectors of performance
Data source: Eurostat

Not surprisingly, the public sector (GOV + HES) is the main recipient of government funded GERD but starting up till 2011 the share of the funding going from the government to the private sector. After 2011, this share decreased again. By 2014 it was less than a third of the money invested in 2010. Public support to private R&D has increasingly been organised as a function of private R&D expenditures: tax incentives and the TKI allowance only cost the government money when private firms make R&D investments or in the case of the innovation box, make profit from them (see section 3).¹²⁵

¹²² JRC IPTS RIO elaboration of DG RTD CORDA data. It is not fully compatible with data reported at the national level.

¹²³ Jan van Steen, [Total Investments in Research and Innovation \(TWIN\) 2013-2019](#), Facts & Figures, Rathenau Instituut

¹²⁴ JRC IPTS RIO estimate on the basis of DG REGIO data. Van Steen reports estimates of 100 million euro on R&D funding from the structural funds in 2014. Jan van Steen, [Total Investments in Research and Innovation \(TWIN\) 2013-2019](#), Facts & Figures, Rathenau Instituut

¹²⁵ National statistical data indicates that in 2014, business expenditures (7.4 bn EUR) and universities (4.2 bn EUR) both increased their expenditures in R&D in comparison to 2013. Government research institutes saw their level of expenditures decline from 1.6 to 1.5 bn EUR. This is mainly, though not fully, a consequence of a reduction in government support of these institutes. Together government research institutes and universities received 4160 MEUR in government support in 2014 compared to 4105 MEUR in 2013. Direct support to business decreased somewhat in nominal values from 143 MEUR to 118 MEUR. <http://www.cbs.nl/nl-NL/menu/themas/bedrijven/publicaties/artikelen/archief/2015/2015-meer-onderzoek-en-innovatie-bij-nederlandse-bedrijven.htm>

3.2.3 Indirect funding - tax incentives and foregone tax revenues

*"In the Netherlands, R&D tax incentives are important compared to direct government funding of business enterprise expenditures on R&D (BERD). The R&D tax allowances comprised about 75-80 percent of total government support to private sector R&D"*¹²⁶

Figure 6 and the table next to it provide an overview of the evolution of R&D tax incentives from 2005 onwards, for two of the main Dutch R&D tax incentives: the research and development promotion act (WBSO) and the RDA. There is a third form of R&D&I related tax incentives which does not feature in the national budgets, called the "innovation box". The cost to the government for this instrument in 2011 was estimated at 0.567 bn euro.¹²⁷ For 2015, 0.625 bn euro was budgeted for the innovation box.¹²⁸ (see also section 3.5.2). Assuming all this money is used, the total foregone tax revenues due to fiscal incentives is 1657 million euro. This corresponds to roughly 25% of GBAORD (see also figure 5).

The rise in 2009 can be explained by a *"change in the definition which from thereon also includes the development of (software) programmes for ICT services. The cabinet reserved around 20 million for this. In addition to this structural increase of the WBSO budget, in the spring of 2009 the cabinet approved an incidental increase of 150 million to support companies during the economic crisis. The budget after 2009 was maintained and even increased after this year."*¹²⁹ As from 2016 the WBSO and RDA are merged together. It is important to realise that, while representing a substantial amount of foregone tax revenues, the innovation box is included in the figure nor the table (see footnote 128).

year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
WBSO + RDA	359	377	410	445	701	860	915	859	992	1066	1040	1151	1128	1128

Figure 6: evolution of foregone tax revenues due to R&D tax credits (WBSO + RDA only).

¹²⁶ OECD STI Scoreboard 2013. OECD STI Outlook 2014. CPB Netherlands Bureau for Economic Policy Analysis, 2014, A Study on R&D Tax Incentives Annex: Country fiches DRAFT FINAL REPORT, European Commission, DG Taxud

¹²⁷ <http://www.rathenau.nl/en/publications/publication/total-investment-in-research-and-innovation-twin-2012-2018.html>

¹²⁸ The reported €625mln is an internal guideline rather than that the Innovationbox is capped at this amount. The actual amount of tax reduction provided to innovation-based profits depends on how much the instrument is used de facto, which to a large extent is influenced by how much profits companies make. This can only be determined afterwards. Over the course of 2010-2012 (latest year available), the provided tax reduction was estimated to have increased from €345.000 to €852.000 (*Kamerbrief January 2015*). See evaluation in section 3.5.2 for recent estimates.

¹²⁹ Agency NL, Ministry of Economic Affairs, *Focus op Speur en Ontwikkelingswerk, het gebruik van de WBSO in 2009*

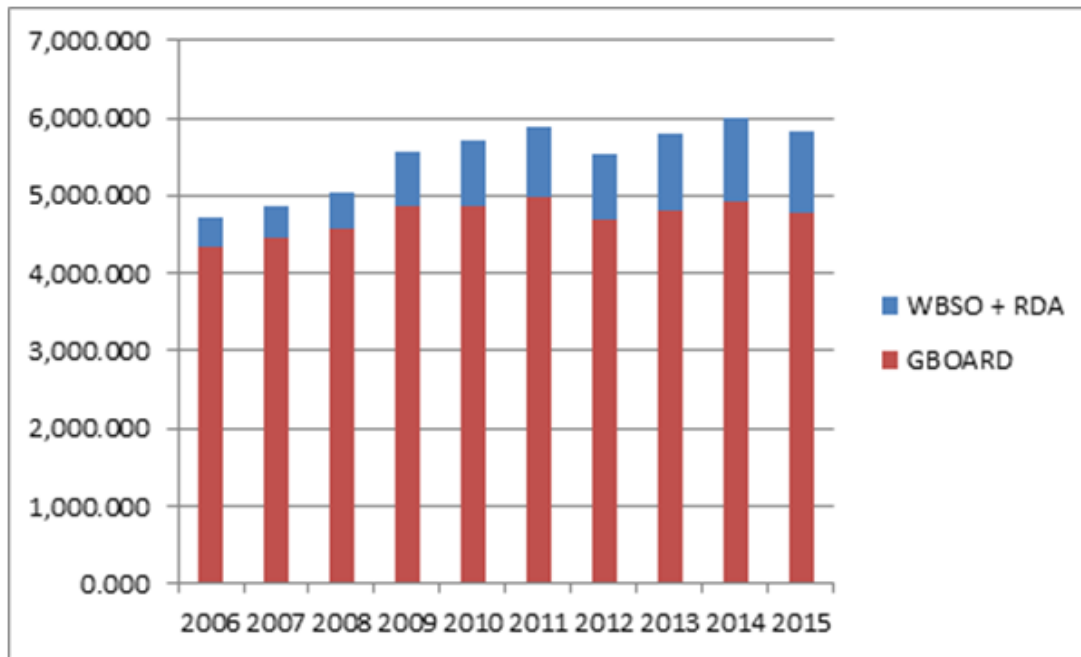


Figure 7: gives an idea of the evolution of the relative size direct and indirect R&D support by the Dutch government.¹³⁰

3.2.4 Fiscal consolidation and R&D

In line with the European Semester's CSR, the Dutch budget deficit was effectively responded to with a €6bln consolidation program over the past two years.⁹⁸ Forecasts indicated that, in combination with economic recovery, this will result in a deficit reduction from -2.3% to -1.8 to -1.2% in the period 2014-2016. By the end of that period, the structural deficit is estimated to be at -0.5%, implying that the Netherlands will comply with the Stability and Growth Pact medium-term objectives.

R&D appropriations (GBAORD) faced steady growth throughout 2005-2011, in spite of the gradual budgetary adjustments. In 2012 it faced a decrease both nominally, by around 300 MEUR (Figure 3) and as a share of GDP by ca. 0.05%. This decrease has been followed by the government funded GERD with one year time lag, i.e. in 2013, the year in which a relatively stronger fiscal adjustment has also taken place (Figure 2, left).

Figure 8, below shows the scatterplot of the structural balance and GBAORD as % GDP, first panel as well as GERD as % GDP, second panel.¹³¹

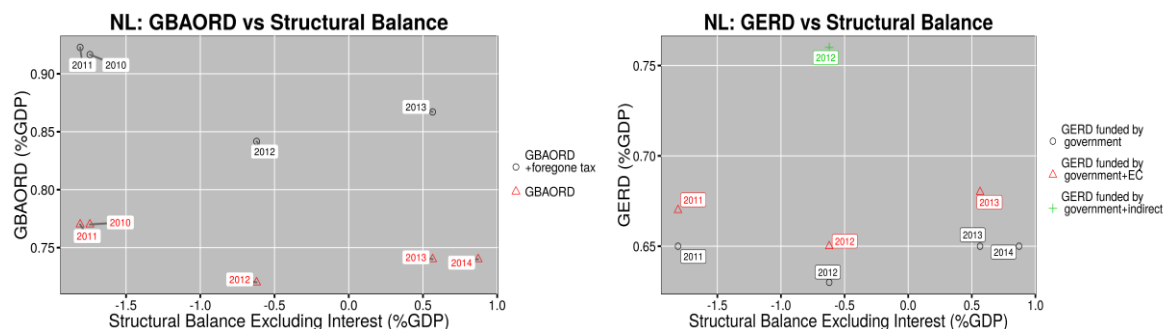


Figure 8: Fiscal consolidation and R&D
Data source: AMECO, Eurostat

¹³⁰ Source: for both the table and the figure, for 1998-2010 Agentschap NL and Ministry of Finance in Evaluation WBSO report, for 2011 to 2020 Rijksbegroting (national accounts) 2011-2016.

¹³¹ Structural balance data comes from the AMECO database the other indicators were taken from Eurostat.

Based on Figure 8, fiscal consolidation had a negative impact on R&D appropriations between 2011 and 2013, translating into a loss in GBAORD of around 0.05% of GDP (i.e. the difference between 2013 and 2011 data for GBAORD including foregone tax revenues). However, in terms of expenditures (Figure 5, right) the fiscal adjustment has not come at the expense of governmental R&D investments in 2011-2014.

As briefly touched upon in section 2.3, the Dutch government has aimed to spare expenditures with direct importance for sustained economic growth. The NRP 2015 prominently states that budget cuts on education and R&I were largely omitted, although it is also admitted that in absolute terms public funding for R&I is gradually declining from 2014 onwards. This development is partially related to the fact that R&I investments were intensified after the financial and economic crises set in. Taking 2008 as a benchmark, the budgets for the coming years will still exceed the original level of public funding for R&I. The Budgets for 2015 and 2016 indicate that consolidation is especially manifested in non-R&I expenditures.

3.3 Funding flows

3.3.1 Research funders

Research funding in the Netherlands is primarily made available by the Ministry of ECS, followed at large distance by the Ministry of EA. A large part of the ECS' research budget not provided directly to HEI's, PRO's or international institutions is allocated by the Netherlands Organisation for Scientific Research (NWO), the Technology Foundation STW (an independent part of NWO), and the Royal Netherlands Academy of Arts and Sciences (KNAW). Funding flows by these organisations are reported in the subsections on project funding (NWO) and institutional funding (KNAW). RVO.nl, the agency responsible for allocating and managing funding provided by the Ministry of EA, tends to work with project funding as well.

Charitable organizations are the main source of private not-for-profit funding of public research in the Netherlands. A recent study by the AWTI shows that their contribution to the total public funding budget, estimated at 3.3% of GERD is similar to shares found in other European countries.¹³² Remarkable about the Dutch case is that most funding comes from healthcare funds. 19 of them are collaborating in the Cooperative Health Funds (SGF), which is backed by 5 million donors and 800.000 volunteers. Increasingly, SGF is taking a proactive role, selecting thematic areas (based on societal needs) and aligning her funding programs with NWO and the Top Sector Life Sciences & Health.

¹³² AWTI (October 2014). [The role of foundations for science in the Netherlands](#). In Dutch.

While the annual budget available for research used to lay around €150mln, this increased to more than €190mln in 2014.¹³³ As the costs increased along, the research share in total funding available from SGF sticks around 40%.

3.3.2 Funding sources and funding flows

Public funding flows

In the Netherlands, public funding for R&D&I comes predominantly from the Ministry of Education, Culture and Science and the Ministry of Economic Affairs. Whereas the first one mainly focuses on fundamental research, the innovation policies of EA are more oriented towards the commercialization of new knowledge. As for the balance in funding: the total budget for fundamental research is significantly larger than the budget available for applied research and support for innovation activities by businesses. Direct R&D support by the Ministry of ECS amounted to €3471mln in 2015, compared to only €883mln by the Ministry of EA.¹³⁴ Out of these amounts, €294mln respectively €767mln is deemed innovation-relevant (i.e. a small share of ECS budget, and a large share of EA's smaller budget), indicating that the still the majority of direct R&D funding is focused on research. Also when taking direct non-R&D innovation expenditure into account (€137mln, almost entirely on EA's budget) or even indirect tax incentives for R&D&I (€1043mln of WBSO/RDA), the balance does not tip. During the coming years the ECS's budgets for direct R&D remain equal while EA's budget decreases from more than €1000mln to about €700mln in the period 2014-2019.

The table below shows a more detailed composition of Dutch public funding for R&D&I, based on the most recent available information of annual budgets. The figures at the national level are provided in the NRP 2015; they are similar to the ones discussed above but are reported using a different breakdown (not by ministry). Regional and local contribution to national policy appear to be of minor importance only, with an estimated budget of €100mln per year at the regional level and even less at the Provincial level (as noted in section 1.2.1, however, the Provinces and municipalities also develop and finance their own programs). The €100mln already include contributions by European structural funds (ERDF). As the 2014-2020 European funding program offers ample room to regional development, this amount is expected to increase.

Also European funding for R&D allocated through Horizon2020 might increase, as it has a budget that is larger than ever before (€80bln). Taking the same return percentage as observed in FP7 (counting with 7.4%) and distributing it over timetable of Horizon2020, the Rathenau Institute arrives at a total volume of €800mln of research funding per year. In FP7, more than half of money went to the higher education sector, while research institutes and enterprises divided most of the remaining part. Horizon2020 is more oriented towards commercialisation, which implies that more than half of the €800mln might become available as public funding for applied research and innovation. Relative to the annual budget by the Dutch government, i.e. the €363mln reported in Table 5, this amount is rather substantial.

¹³³ Rathenau Institute. [Healthcare funds](#). In Dutch. Accessed at 26-09-2015.

¹³⁴ Rathenau Institute. [Total Investments in Research and Innovation \(TWIN\) 2013-2019](#).

Table 5: Estimation of public funding flows (Sources: NRP, 2015; TWIN 2013-2019).

	Average annual budget (€mln)	% of table total
Fundamental research	3217	39%
Applied research	364	4%
R&I expenditures other departments	1335	16%
Fiscal support for R&I	1667	20%
Regions (ERDF)	100	1%
Provinces	70	1%
ROM's	120	1%
FP7*	475	6%
Horizon2020*	800	10%

* Horizon2020 follows up on FP7: note that in reality these flows occur only partially at the same time.

Private funding flows

According to the most recent Eurostat-data available, private funding flows in the Netherlands are hardly increasing. In 2013 the business sector had an R&D performance of €7095mln, which amounts to €423 per inhabitant (see table below). Most of the research performed by the Dutch business enterprise sector is financed by that sector itself. A second major source of funding is FDI. Private R&D funding from abroad was reported (by Eurostat) to be almost twice as high as the government contribution. This stands in contrast with the European average ratio of 2:3. Of course it should be noted that the Dutch government does take many actions aimed at attracting R&D&I funding from abroad. See section 5.6 for a discussion of framework conditions for attracting FDI. As noted in section 3.3.1, the private non-profit sector is quite important for R&D funding as well.

Table 6: Total intramural R&D expenditure (business enterprise sector) by source of funds in millions €. [Eurostat: rd_e_gerdfund; last accessed on 04-04-2016]

	Netherlands		European Union (28 countries)	
	2012	2013	2012	2013
All sectors	7,078	7,095	171,634	174,387
Business enterprise sector	5,851 (82,7%)	5,946 (83,8%)	171,634	143,887
Government sector	554 (7,8%)	450 (6,3%)	11,580	:
Higher education sector	10 (0,1%)	17 (0,2%)	47	66
Private non-profit sector	31 (0,4%)	32 (0,5%)	391	315
Abroad	1,029 (14,5%)	957 (13,5%)	18,281	:
Abroad - Business enterprise sector	962 (13,6%)	898 (12,7%)	:	:
Abroad - Private non-profit sector	:	:	:	:
Abroad - Government sector	:	:	:	:
Abroad - Higher education sector	31 (0,4%)	22 (0,3%)	:	:
Abroad - European Commission	35 (0,5%)	35 (0,5%)	:	:
Abroad - International Organisations	1 (0,0%)	2 (0,0%)	:	:
Abroad - other	:	:	:	:
Abroad - enterprises within the same group	688 (9,7%)	675 (9,5%)	:	:
Abroad - other business enterprise companies	275 (3,9%)	223 (3,1%)	:	:

3.4 Public funding for public R&I

3.4.1 Project vs. institutional allocation of public funding

Following up on a general agreement with the association for universities (VSNU), the Ministry of ECS made 'performance agreements' with each individual HEI for the period 2012-2015.¹³⁵ The three main targets of these agreements are: further differentiation of education; a better thematic focus and profile of research; and increased societal and economic relevance (e.g. through more knowledge valorization).

¹³⁵ Ministry of ECS (December 2014). [Midterm review performance agreements HEIs](#).

An extra goal was to establish an education culture spurring the ambition and success of students, for which performance indicators have been developed. Part of the agreements is that 7% of the budget for education is allocated based on whether universities succeed in meeting their targets (5% for education quality and study success, 2% for improving scientific and educational profile).¹³⁶

In 2012, before starting the experiment with performance agreements, Dutch universities and university medical centers received €3.8bln euros from the central government (CPB, 2014). Around 41% of this organizational level funding was allocated on the basis of education related criteria, while 44% was allocated on the basis of research parameters. The only clear research indicator on this account is the number of PhD theses defended. The remaining 15% was allocated to Academic Medical Centers. A CPB-study from 2014 describes the criteria used to allocate the education and research part of organizational funding.¹³⁷

Education funding: (€1.6bln in 2012) funding allocation is based on student numbers and degrees (65%). The remaining 35% of education funding is based on university specific percentages and amounts which are set by the government.

Research funding: The part of university funding which is allocated on the basis of research parameters includes criteria for degrees (15%), PhD defenses (20% or €93.000 per defended PhD, around 5% is spend on the funding of (often inter-university) graduate schools. The remaining 60% is allocated on the basis of block funding based on historical considerations, though 2% is set directly by the government.

With respect to the figures reported in the CPB-study it should be noted that there are alternative ways to calculate the balance in allocation mechanisms, like the one proposed by Hicks (2012).¹³⁸ The last TWIN report states that project funding in the Netherlands is increasing to maximally 30% over the next years, after which it will drop back to about 28% in 2019. Differences in allocation statistics tend to be related to the choice to report only on funding for education, or also to report on funding for research. As especially the latter is done through competitive schemes, it can largely affect the observed distribution of funds.

3.4.2 Institutional funding

Traditionally, the Netherlands belong to the group of countries characterized by intensive use of institutional (block) funding.¹³⁹ In the past years, the government has started to make university funding based on performance contracts. This reform replaced an earlier trial of contract funding, during which performance contracts were signed with the 'university of applied science' sector. This experience suggested that the collective agreements were not sufficiently aligned to the strategic targets of the individual HEI. For some the objectives were unrealistic, for others insufficiently challenging.¹⁴⁰

As noted in the section above, 7% of the core funding for universities on the budgets for 2012-2016 is now based on performance contracts. The major part (5% of total higher education budget) concerns funding conditional on the extent universities achieve their education targets with respect to education quality and output, while the other part (2%) is allocated selectively for improvement of education and scientific profiling.

¹³⁶ Ministry of ECS and VSNU (December 2011). [Hoofdlijnenakkoord OCW-VSNU](#). In Dutch.

¹³⁷ CPB (March 2014) [Public funding of science: An international comparison](#).

¹³⁸ Hicks, D. (2012). Performance-based university research funding systems, Research Policy 41 (2), pp 251–261.

¹³⁹ Van Steen (2012). [Modes of public funding of research and development, Towards internationally comparable indicators](#). OECD Science, Technology and Industry Working Papers.

¹⁴⁰ De Boer, HF., Jongbloed, B., Bennenworth, P., Cremonini, L., Kolster, R., Kottmann, A., Lemmens Krug, K., Vossensteyn, H., 2015. [Performance-based funding and performance agreements in fourteen higher education systems - Report for the Ministry of Education, Culture and Science](#), Enschede: CHEPS, University of Twente.

An evaluation of this mechanism, resulting from the performance agreements, is foreseen for 2016. As is the case in the Enterprise Policy, progress is monitored already during the execution of the strategy. This is done by the Review Commission Higher Education (RCHO), as well as by the HEIs themselves. A midterm review by the RCHO was offered to the Ministry of ECS in November 2014. The report concluded that all Dutch universities have been strengthening their scientific focus, through clustering, collaboration and phasing out. Also attempts to differentiate educational programs were evaluated positively. The most prominently expressed concerns pertain to the objective of increasing both the quantity and quality of graduates while the level of inflowing students is insufficient: many institutions perceive this as a trade-off ('trilemma'). The RCHO notes that progress indicators with respect to study success are not part of the performance agreements on the basis of which funding is allocated (contrary to indicators regarding education quality). The commission is optimistic about how the performance agreements can contribute to aligning national R&D policies (e.g. Top Sectors, grand challenges, human capital agendas, joint research initiatives, Horizon2020) with university strategies. In her [letter](#) to the cabinet from April 2015, the Minister of ECS repeated the positive findings in the RCHO-report.

Also in April 2015, the VSNU federation of universities presented her own progress report, showing already how many universities improved their performance by establishing excellence trajectories (e.g. University Colleges), how teacher quality has improved, and how student drop-out and study switch have been reduced.¹⁴¹ Earlier, however, the VSNU also has been criticizing the fact that changes in legal and financial arrangements hamper universities to develop and realize a stabile research and education strategy. The head of the VSNU argued it would be better to turn the 7% of performance funding (which can amount to €300mIn annually) back into lumpsum funding and simply let the universities make performance agreements with their own councils and boards. This allows for more room to adapt agreements and rewards to university-specific contexts.¹⁴² The feeling that education is being steered too much from an efficiency perspective led to a nationwide discussion and student protests during the entire spring of 2015. Although the most symbolic protest had the form of students occupying a campus building of the University of Amsterdam, the movements against performance-thinking is significantly larger.¹⁴³ Students, teachers and other supporters throughout the country, sometimes united in student-right organizations or initiatives like the New University/Humanities Rally, have protested against university managers executing budget cuts (e.g. shutting down smaller studies) on the basis inadequately operationalized indicators and without consulting immediate stakeholders.¹⁴⁴

Apart from research universities, the Netherlands also has a system of universities of applied science. In total these 37 universities spend around 100 million euro on research and they are funded almost entirely on the basis of education related criteria.

Separate from the funding allocation system, universities are also regularly evaluated at the level of departments/schools and programmes. This peer review based research assessment system was implemented in the late 1980. Rather than being linked to university funding, the assessment is used to support the development university (and national) strategies. According to Geuna and Piolatto¹⁴⁵ it does generate a competition for reputation among the university departments.

¹⁴¹ VSNU (September 2015). [Annual report performance agreements 2014](#). In Dutch.

¹⁴² Dekker, M. (April 2015). [Universities would like to abandon performance agreements](#). NRC. In Dutch.

¹⁴³ Duits, L. (March 2015). [10 misapprehensions of the Maagdenhuis occupation](#). In Dutch.

¹⁴⁴ See, for instance: LSVb/ISO (April 2015). [Effects of the performance agreements](#). In Dutch.

¹⁴⁵ Geuna, A., Piolatto, M., 2016, Research assessment in the UK and Italy: Costly and difficult, but probably worth it (at least for a while), Research Policy, Volume 45, Issue 1, Pages 260–271

In 2015 a decision was made to change the research output criteria and no longer include the volume of publications as a criterion in evaluations due to concerns over the adverse effects of publication pressure. See Jonkers and Zacharewicz¹⁴⁶ (2016) for a comparative analysis of Performance Based funding in the EU 28 Member States.

3.4.3 Project funding

Project funding is to a large extent being allocated by NWO. The share of funding that is provided by NWO is mostly based on program and project proposals. In 2014, NWO invested €767mIn (2013: €735mIn), of which €512mIn euro was allocated to universities and other institutes (excluding intra-organizational allocation through NWO institutes) based on competition.¹⁴⁷ As also announced in the Science Vision 2025, the Ministry of ECS believed it to be time to change the organizational structure of NWO in 2015. The organization, with all its boards and directors, is regarded as being too bureaucratic and complex. Governance can be improved by transforming the organization in such a way that barriers between departments are lowered. The reorganization of NWO is also supposed to respond to criticism on the focus in current science on publications and acquisition of research funding.¹⁴⁸ A complete section in the new science strategy is devoted to lowering publication pressure and pressure for writing research proposals.¹⁴⁹ In April 2015, NWO released her strategy for the period 2015-2018.¹⁵⁰ The document describes how she will react to the requested changes expressed in the Science Vision. Although the contours for the reorganisation of NWO have been designed already, the transformation is expected to be completed not before 2017.¹⁵¹ In an open letter to Dutch universities, a substantial number of Spinoza Prize winners (the most prestigious Dutch scientific award) expressed concerns about the intended reorganization. Since many management roles within the NWO will not or less be performed by scientists anymore in the near future, they fear that the NWOs policy will not change for the better. According to ECS, however, scientists will remain influential in the new NWO and its funding decisions. Also, a complete section in the new science strategy (Science Vision 2025) is devoted to lowering publication pressure and pressure for writing research proposals.¹⁵²

Apart from reforming fundamental science funding, a substantial share of the budget for applied research is being allocated for research projects executed in one or multiple Top Sectors. As for the national institutes for applied research, the government declared to reduce fixed block-funding with 20% over the period 2011-2016. Instead, the institutes have to find co-funding from private parties, thereby ensuring the practical relevance of the research. Besides directly collaborating in research projects, the institutes can also participate in studies performed together with the Top consortia for Knowledge and Innovation, thus earning funding from the TKI-allowance (see section 5.7).

¹⁴⁶ Jonkers, K. & Zacharewicz, T., [Research Performance Based Funding Systems: a Comparative Assessment](#), EUR 27477 EN; doi10.2791/134058

¹⁴⁷ NWO (2015). [Annual report 2014](#). In Dutch.

¹⁴⁸ Most visible through the publications of the movement of critical scientists 'Science in transition' and its publications. See <http://www.scienceintransition.nl/english> (accessed February 2015). One of the elements that Science in Transition is weary of is the publication rat race (at the expense of other tasks of the universities) and efficiency and utility thinking in science in general.

¹⁴⁹ Ministry of ECS (2014). 2025. [Vision for Science. Choices for the future](#).

¹⁵⁰ NWO (April 2015). [NWO Strategy 2015-2018](#).

¹⁵¹ ScienceGuide (October 2015). [Grand Départ NWO en route](#). In Dutch.

¹⁵² Ministry of Education, Culture and Science (November 2014): [Science vision 2025](#). In Dutch.

3.4.4 Other allocation mechanisms

Research is also funded through contract research set out by ministries. Every ministry makes use of several institutes for conducting research relevant to the policy domain it is responsible for. The Ministry of Economic Affairs, for instance, relies heavily on the Netherlands Organisation for Applied Scientific Research and the large technological institutes (TNO and GTIs, together now the TO2 federation), and the top technological institutes (TTIs, now transitioned into TKI's). For its agriculture branch the Wageningen University and Research Centre (WUR, including DLO) is of great importance, while contract research related to aviation engineering is conducted in yet another institute. The overview of total investments in science and technology (TWIN), below, shows how the ministries differ in their shares of institutional and project funding. Many of the research institutes have a triple helix profile, meaning they attract additional funds from universities and firms as well. For the TKI's, almost half of the research they conduct should be funded by private companies.

Table 7: R&D expenditure, and share of project funding. 2015 figures. (Rathenau: TWIN 2013-2019)

Ministry	Total R&D expenditure (mln €)	% project-based
Ministry of General Affairs	0,6	100,0
Ministry of Foreign Affairs	44,3	99,5
Ministry of Security and Justice	21,5	23,4
Ministry of the Interior and Kingdom Relations	19,9	100,0
Ministry of Education, Culture and Science	3.470,7	19,8
Ministry of Defence	58,4	41,7
Ministry of Infrastructure and the Environment	57,0	67,3
Ministry of Economic Affairs	882,8	56,6
Ministry of Social Affairs and Employment	1,3	100,0
Ministry of Health, Welfare and Sport	223,1	62,6
Total	4.779,7	30,6

3.5 Public funding for private R&D

3.5.1 Direct funding for private R&I

With the introduction of the Enterprise Policy, the government reconsidered the way in which support to research and innovation helps to support economic growth. Instead of directly subsidizing R&D&I, the ministry of EA mainly supports firms to participate in public-private research collaborations or allow them to deduct costs related to engaging in R&D (see sections 2.2).

The main public programs aimed at stimulating R&I are the TKI's for collaborative research PPS (see 4.4), the WBSO/RDA tax schemes (see 3.5.2), and several funds for ambitious SME's, some of them related to Top Sectors (e.g. MIT). All the aforementioned measures are generally believed to be functioning well. A comprehensive list of the most important interventions is included in Annex 4.

There is an overall tendency in the Netherlands to mainly finance the first parts of the knowledge chain rather than the later parts closer to the market. It is expected that knowledge spillovers are considered to be higher in the early stages of this knowledge chain. This also largely explains why funding for types of knowledge which are perceived to be closer to the marketplace, e.g. related to service innovation or social innovation, is scarce and debated.

Public private cooperation is particularly supported through the TKIs, as described in section 4.4. The Dutch government is currently experimenting with various novel ways to provide funding for R&D. The most prominent developments are reported in section 1.2. Important in the Enterprise Policy are also the measures taken to reduce administrative burdens, like for instance the new approach 'Future proof law and regulation' (see section 5.7). Due to the large number of available funding schemes it might be hard to understand the specific targeting of each individual policy measure, but the accessibility of the measures is normally ensured by central institutions or websites like RVO.nl and Ondernemerspleinen.nl. Moreover, in fall 2015, the Ministry of EA launched a National Funding Guide ([Nationale Financieringswijzer](#)). This website/app provides comprehensive information to especially SMEs looking for funding.

By law, all of the measures are evaluated once in a while. An overview of evaluations is provided in the meta-evaluation of the Innovation and Entrepreneurship Policy Mix.⁴⁹ Furthermore, many of the R&D&I instruments are benchmarked internationally due to participation in international evaluation consortia like [TAFTIE](#) (European Association of leading national innovation agencies). As from 2015 onwards, the Ministry of EA is also active in the [Innovaton Growth Lab](#) (by NESTA, the Kaufman Foundation and the Argidius Foundation) for exchanging findings on policy experiments. In the context of European collaboration it is also important to note the creation of the Dutch Investment Agency (Nederlands Investerings Agentschap NIA) in the summer of 2015. In October 2015, the Minister of EA explained how the NIA has an important role in helping Dutch firms to benefit from the newly established EFSI-fund.¹⁵³

Public Procurement of Innovative Solutions

The Dutch government procures around €60 billion worth of work, services and supplies every year.¹⁵⁴ By far the largest share of these expenditures are not made by the central government. Within the central government the ministry for Infrastructure and the Environment¹⁵⁵ has the largest procurement budget, followed by the ministry of Defence.

The cabinet currently aims to make 2.5% of all public procurement to be public procurement of innovations. The emphasis is on the initiating and realisation of new innovation oriented public purchase trajectories. The results of a research project show that in 9.1% of the public procurements included in the sample the government has been considering innovative solutions, in 6% procurement has been innovation oriented and in 5.3% this has led to an innovative solution.

¹⁵³ Ministry of Economic Affairs (October 2015). [Establishing the Dutch Investment Agency \(NIA\)](#). In Dutch.

¹⁵⁴ <http://www.piano.nl/about-piano>

¹⁵⁵ The ministry of Infrastructure and the Environment is not shown in the figure below, but it integrates "verkeer and waterstaat" which merged with other ministries to form I&M (I&M is the merger of Verkeer en Waterstaat and VROM)

On the basis of the sample of 81 procurements, it is not yet possible to assess whether the 2.5% target has been met, but the monitoring approach is being improved.¹⁵⁶

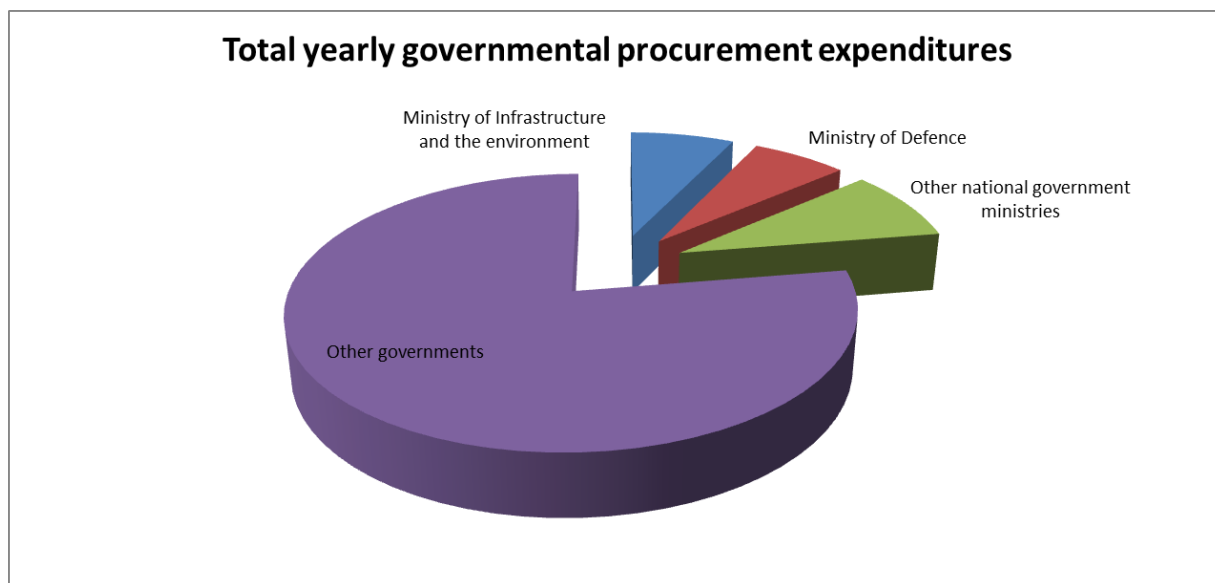


Figure 9: Total Yearly governmental procurement expenditures

Legal Public Procurement framework

The Directive 2004/17/CE on public procurement has been transposed into national law in 2005 (Besluit aanbestedingsregels voor overheidsopdrachten (Bao)¹⁵⁷, het Besluit aanbestedingen speciale sectoren (Bass)¹⁵⁸). Directive 2007/66/EG was implemented in the law implementation of legal protection directives procurement: "Wet implementatie rechtsbeschermingsrichtlijnen aanbesteden – Wira"¹⁵⁹

Since April 2013 the Bao, Bass and Wira have been replaced by the procurement law 2012 for all procurement of (semi) public institutions in the Netherlands. Through this national law, the Netherlands implements the European procurement directives^{160 161}.

¹⁵⁶ Voortgangsreportage innovatiegericht inkopen: innovaties versterken de inkoopkracht van de overhead, bijlage bij de voortgangsreportage Bedrijvenbeleid 2013 BEDRIJVENBELEID IN VOLLE GANG <http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2013/10/02/voortgangsrapportage-innovatiegericht-inkopen.html>

¹⁵⁷ <http://www.rijksoverheid.nl/documenten-en-publicaties/besluiten/2008/12/10/besluit-aanbestedingsregels-voor-overheidsopdrachten-bao-recent.html>

¹⁵⁸ <http://www.rijksoverheid.nl/documenten-en-publicaties/besluiten/2008/12/10/besluit-aanbestedingen-speciale-sectoren-bass-recent.html>

¹⁵⁹ <http://www.pianoo.nl/sites/default/files/documents/documents/wetwira28januari2010.pdf>

¹⁶⁰ Directive 2004/18 on the co-ordination of procedures for the award of public works contracts, public supply contracts and public service contracts (Consolidated Public Sector Directive). Directive 2004/17 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors (Utilities Directive). Directive 2007/66/EC amending Directives 89/665/EEC and 92/13/EEC with regard to improving the effectiveness of review procedures concerning the award of public contracts (Public Contracts Review Procedures Directive)

¹⁶¹ The Procurement law 2012 contains both rules for procurements above the European threshold amounts, as below them. A few measures from the procurement law 2012 have been further detailed in the procurement decision ("Algemene Maatregel van Bestuur – Aanbestedingsbesluit"). Part of this decision are the "Procurement Rules Works 2012", the templates "own declaration" and the "proportionality guide". Dutch public procurement law recognises the general principles of public procurement law (non-discrimination, transparency and proportionality). The ministry of Economic affairs has developed supplementary policy to cover the following aspects: Professionalisation procurers - Professionaliserende opdrachtgevers (PIANOo); Guideline supplies and services - [Richtsnoer Leveringen en Diensten](#); Advice complaint handling for procurement - [Advies Klachtafhandeling bij aanbesteden](#); Procurement rules for works - [Aanbestedingsreglement voor Werken, ARW 2012](#); System of verification/pre-qualification/procurement passport - [Systeem van verificatie/prekwalificatie/aanbestedingspaspoort](#); VNG model general purchase conditions for supplies and services - [VNG Model Algemene Inkoopvoorwaarden voor leveringen en diensten](#); VNG model purchase and procurement policy - [VNG model inkoop- en aanbestedingsbeleid](#)

The PCP/PPI landscape

In the Netherlands specific attention for procurement of innovative solutions started in 2004 with the growing awareness that public procurement of innovative products and services could contribute to the solution of important societal problems and innovation policy objectives. In 2007, the government agreement explicitly stated several policies related to public procurement of innovation. The current approach to public procurement of innovation started in 2009. In a letter from the minister of economic affairs (27 406 nr 162), the definition of innovation oriented public procurement was broadened. Previously the focus was on the government as launching customer (the first purchaser of innovations). From 2009 the focus is on the complete procurement process, from strategy formation to up-scaling. The government as "lead customer" searches for innovative solutions or offers spaces to companies to come up with innovative solutions.¹⁶²

The government wants to further strengthen the **top sectors** in which the Netherlands has a leading position worldwide. To achieve this, the government, companies, universities and research centres will work together on knowledge and innovation. The agreements on this have been set in so-called innovation contracts. For each of the 9 top sectors an innovation contract has been made.¹⁶³ Included in these innovation contracts are measures, plans and agreements to further strengthen the top sectors in the coming years. In addition ICT, nanotechnology and biobased economy are topics that concern multiple top sectors; for this action agendas have been set. Within the top sectors there is ample attention for using the procurement budget for innovation to address societal challenges.¹⁶⁴ The website of Pianoo¹⁶⁵ provides an overview of PPI and SBIR projects/targets in the top sectors.

PCP/PPI Initiatives in the Netherlands

Inkoop Innovatie Urgent¹⁶⁶

In consultation with the employer organisations, the responsible ministries (infrastructure and environment, economic affairs) have agreed to bring together trajectories that lead to sustainable innovations and the development of several public procurement instruments in the programme IIU. The programme "inkoop innovation urgent", (urgent: public procurement), established in 2012, has a promoting and exemplifying function. This program targets national, regional governments, other non-profit organisations and health care organisations.¹⁶⁷ It achieves results in flagship programs, which are targeted at societal challenges for which companies can offer solutions. These solutions can be procured by the government.

This [projectenboek](#) describes a number of projects (see also table 1) which are supported through IIU. The program is coordinated by a coordination group. This group consists of representatives from different governmental organisations such as the central government, municipalities, provinces and companies.

¹⁶² Voortgangsreportage innovatiegericht inkopen: innovaties versterken de inkoopkracht van de overheid, bijlage bij de voortgangsreportage Bedrijvenbeleid 2013 BEDRIJVENBELEID IN VOLLE GANG. <http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2013/10/02/voortgangsrapportage-innovatiegericht-inkopen.html>

¹⁶³ Agri&Food, Horticulture; Creative Industry; Water; high tech; Energy; Chemistry; Life Sciences en Health; Logistics

¹⁶⁴ See also [Investeren in topsectoren](#)

¹⁶⁵ <http://www.pianoo.nl/sites/default/files/documents/documents/overzichtinnovatiegerichtinkopenensbirintopsectorenagenda.pdf>

¹⁶⁶ For a detailed video-animation of the programme see: <http://animation.inkoopinnovatieurgent.nl/>

¹⁶⁷ See also: www.inkoopinnovatieurgent.nl

Like the *Small Business Innovation Research Programme* ([SBIR](#)) which is discussed later on in this section, the IIU initiative is project-based. In 2013, a total of 27 projects had been initiated to address the eight societal challenges around which Inkoop Innovatie Urgent is centered. 23 of them resulted into actual results and received permission to continue. These developments were presented in a [policy letter](#) attached to the Progress Report Enterprise Policy 2013. Inkoop Innovatie Urgent is supported by *PIANOo*. In order to link supply and demand of innovative solutions in an early stage, it developed a virtual market place (www.innovatiemarkt.nl) (Janssen & Den Hertog, forthcoming).

PIANOo

PIANOo, the Netherlands knowledge network for government procurers, was initiated in 2005. This network creates connections between public procurers to exchange best practices and knowledge. In order to do this, PIANOo organises meetings and seminars and deploys virtual instruments. The website <http://www.innovationmarkt.nl> now offers another platform to facilitate a strong partnership between government and the private sector: a virtual market square where governments search for companies that can offer them innovative solutions.¹⁶⁸ Together they should work towards a healthy entrepreneurial climate, a strong competitive position and the addressing of societal challenges.^{169 170}

SBIR¹⁷¹

The government stimulates innovations by giving R&D-commitments to SMEs (Small Business Innovation Research). This program started with a pilot by the Ministry of Economic Affairs in 2004. The programme was inspired by the US SBIR programme in which governments spent a set percentage of their annual R&D budgets in innovative SMEs. In 2013 the SBIR program is still ongoing but it has been expanded. On average 3 SBIR procurements are made each year.¹⁷² The most important objective of SBIR is to give SMEs the opportunity to come up with innovative solutions for major societal problems and helping them to bring these solutions to the market on a contractual basis. The scheme is now broader in set up and consists of three strands. In the first the RVO (Rijksdienst voor ondernemend Nederland, the successor of AgencyNL) formulates a challenge together with a ministry¹⁷³ or other governmental service. The challenge forms the basis for a public procurement procedure carried out by the RVO. The evaluation committee orders all projects and advises the actor who called for proposals. After a feasibility study there is another round of selection. In the second phase the companies engage in R&D to develop a prototype of the end product, process or service. In the third phase this prototype is prepared for market introduction. This phase is not financed by the government but the network of government actors developed for the SBIR is in a good position to include specification in its tenders that will allow it to engage in large public procurements of the product, process or service.

¹⁶⁸ For example, the city of Rotterdam is looking for new ideas and techniques to create sustainable public spaces. A call on the innovation market yielded 39 companies and innovations, that are now running tests in a Rotterdam trial location

¹⁶⁹ www.innovatiemarkt.nl

¹⁷⁰ TenderNed is the Dutch government's online tendering system. All Dutch authorities are obliged to publish their national and European tenders on TenderNed's announcement platform, so businesses can access all public publications from a single webpage. Through TenderNed, all parties can digitally manage all steps throughout the entire tender process. This is determined by the contracting authority. TenderNed is a certified supplier of the European publication platform Tenders Electronic Daily (TED). TenderNed is a part of PIANOo <https://www.pianoo.nl/public-procurement-in-the-netherlands>

¹⁷¹ A word of caution regarding SBIR: whereas the Dutch government refers to SBIR as a PCP instrument, opinions differ on whether it falls under the EU definition of PCP.

¹⁷² Voortgangsrapportage innovatiegericht inkopen: innovaties versterken de inkoopkracht van de overheid, bijlage bij de voortgangsrapportage Bedrijvenbeleid 2013 BEDRIJVENBELEID IN VOLLE GANG <http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2013/10/02/voortgangsrapportage-innovatiegericht-inkopen.html>

¹⁷³ The SBIR program is an initiative from the ministry of economic affairs in collaboration with the ministries for Defence; Infrastructure and Environment; Education, Culture and Science; and Health, Welfare and Sports. Local governments can also participate.

In over 30% of these pre-commercial procurements the government is the expected customer.¹⁷⁴ The second strand is run by the research council NWO. It aims to address the "valley of death" after academic research by preparing project for investment from private sector risk capital. There are at least several examples in which there is synergy/ complementarity between strand 1 and 2: i.e. RVO coordinates a program between governmental actors and companies, while NWO coordinates a longer term SBIR R&D project on the same theme: e.g. cyber-security. The third strand is similar to the second but it is run by the public research organisation for applied research TNO. It focuses on ideas and research efforts developed by TNO and offered to companies. TNO supports companies to develop commercial applications.¹⁷⁵ Because it is pre-commercial procurement (R&D) these SBIR contracts do not fall under the European procurement directives. In the national programme €3m euro is available to co-finance SBIR-light of regional authorities (provinces and cities) for up to 50% of total costs (Van Putten, 2015).

Innovation procurement in Green Deals

The Green Deals are projects in which authorities make an agreement with societal stakeholders (businesses, civilians, local government, etc.) to take away bottlenecks when it comes to boosting sustainable growth.¹⁷⁶ The role of the government in these Deals is not financial (as in funding projects), but involves improvement of regulations, support in innovative procurement, and certification. Although, the Green Deals fall under the responsibility of the Ministry of EA, many other governments participate as well. (Janssen and Den Hertog, forthcoming). 176 Green Deals have been started between 2011 and 2014 with 1090 participants from companies and sector organisations (70%, SMEs constituted 40% of the participants), local governments (14%), NGOs (8%), research organisations (6%) and financial organisations (2%) (Van der Werff, 2015). The Green Deals programme may form part of the inspiration for the "Innovation Deals" initiative of the European Commission. Table 2 provides some examples of Green Deals.

In the TWIN 2013-2019 report it was reported that in 2012 4.5% to 6.6% of all tenders was seeking an innovative solution, compared to 3.8% to 9.1% in 2011. 3.6 to 5.2% of the tenders concerned an innovation in 2012, compared to 2.5%-6.0% in 2011.¹⁷⁷

3.5.2 Indirect financial support for private R&I

In terms of funding, the main policy shift occurring with the launch of the Enterprise Policy concerns the increasing importance of generic policy in the form of fiscal incentives for R&D. Relevant instruments are the WBSO (tax exemption for R&D wages, 2015 budget is €794 mln), the RDA (tax exemption for R&D equipment, 2015 budget is €238mln), and the Innovationbox (tax exemption for profit derived from innovation or patenting):

The *tax credit for R&D (WBSO)*. With an annual budget of approximately €800mln, the WBSO is a very substantial innovation policy instrument. It provides a tax exemption with respect to the labour costs of R&D employees. Following the evaluation in 2012, there was a budget-neutral reallocation of the funds for the WBSO in 2013, which has enhanced the facility's efficiency and effectiveness.

¹⁷⁴ Voortgangsreportage innovatiegericht inkopen: innovaties versterken de inkoopkracht van de overhead, bijlage bij de [voortgangsreportage Bedrijvenbeleid 2013 BEDRIJVENBELEID IN VOLLE GANG](http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2013/10/02/voortgangsrapportage-innovatiegericht-inkopen.html) <http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2013/10/02/voortgangsrapportage-innovatiegericht-inkopen.html> For further information on the SBIR program see also [Small Business Innovation Research \(SBIR\)](#) and Boekholt, P., Evaluation SBIR in The Netherlands, The Hague 2011

¹⁷⁵ Boekholt, P., [Evaluation SBIR in The Netherlands](#), The Hague 2010.

¹⁷⁶ For an English description: Industrial Efficiency Policy Database, NL-11: Green Deal; <http://iepd.iipnetwork.org/policy/green-deal>.

¹⁷⁷ Jan van Steen, [Total Investments in Research and Innovation \(TWIN\) 2013-2019](#), Facts & Figures, Rathenau Institute

The rates for the WBSO were lowered, the salary threshold for the first bracket was raised and the ceiling was maintained at €14mln euro.

The *Research & Development Allowance (RDA)* was introduced in 2012. The aim of RDA is to make non-wage costs of investments in innovation more attractive (from a fiscal perspective). The RDA offers a higher tax relief for R&D investments in capital equipment and exploitation costs. It is complementary to the 'old' WBSO scheme offering a tax relief on R&D wages. Despite pre-launch intentions to raise the initial budget of €250mln per year with a factor of two, the budget was €302mln in 2014 and planned to decrease to €126mln by 2017. As noted in section 2.2, however, RDA will merge with WBSO from 2016 onwards.

The tax relief for innovation (the *Innovationbox*) offers firms a reduced corporate tax rate for profits derived from in-house developed intangible assets. The official annual budget of the innovation box is €625mln of foregone taxes.

According to a recent evaluation¹⁷⁸, the use of the Innovationbox has been growing rapidly over the past years; from €361mln to €697mln during the period 2010-2012. These figures are subjected to firms' actual profits, which is why even ex-post estimations keep changing and why the budget is exceeded (which might be even more the case in coming years). Based on 'Bang-for-the-buck' econometrics using microdata from Statistics Netherlands, the measure was found to have a positive effect on R&D spending. It is unlikely though that a euro tax relief generates more than one euro R&D investments (the BftB is estimated to be 0.54 on average). As the policy measure applies to profits based on the results of earlier R&D activities, there is no guarantee that firms will actually re-invest the tax relief they enjoy in new R&D activities. However, firms using the Innovationbox appear to be engaging in R&D structurally (especially the ones participating from the beginning). The evaluation stresses that the policy measures seems to meet its second goal, which is improving the attractiveness of the Dutch economy for such R&D intensive firms. A low tax rate helps to maintain national firms and attract foreign ones, although it is important to note that many countries offer such schemes. The Dutch version of a patent box deviates in one important aspect: besides having intellectual property, firms can also qualify for the Innovationbox by an 'R&D statement'. This statement is provided when firms register for the WBSO; the tax scheme for deducting R&D costs. The evaluation shows that a majority of Innovationbox-users uses the statement as their eligibility basis (typically those firms enjoy larger financial benefits from the WBSO than from the Innovationbox). Whether this practice can be maintained depends on the outcomes of the ongoing OECD debate on 'base erosion and tax shifting' (BEPS).

The evaluation study does not offer an overall cost-benefit analysis, but its policy recommendations have been received as a useful basis for improving the instrument.¹⁷⁹ The Ministry of Finance aims to do so before September 2016.

According to Table 8, the fiscal incentives' relative share of 24% (2014) increases to 28% from 2016 onwards. Looking only at in particular the Ministry of EA's budgets, however, the distribution between generic and specific innovation support lies at 90%-10% in 2015.¹⁸⁰ As can be read in the OECD STI Outlooks (e.g. the 2012 edition, p. 351), the dominant place for fiscal R&D support has been a distinctive feature of the Dutch R&I system, and this still remains the case in 2015.¹⁸¹ 49 In a letter to parliament in July 2015, the Ministry of EA confirmed a previously announced merger of the WBSO and RDA schemes, to be implemented as of January 2016.¹⁸²

¹⁷⁸ Dialogic (November 2015). [Evaluation Innovationbox 2010-2012](#). In Dutch.

¹⁷⁹ Ministry of Finance (February 2016). Kamerbrief betreffende Kabinetsreactie evaluatie innovatiebox. In Dutch.

¹⁸⁰ AWTI (October 2015) Top Sector Balance ('Balans van de Top Sectoren') 2014. (In Dutch).

¹⁸¹ OECD (2014). OECD Science, Technology and Industry Outlook 2014.

¹⁸² Ministry of Economic Affairs (July 2015). Integration of fiscal innovation schemes WBSO and RDA.

In the meantime a discussion emerged in January 2015 on the third fiscal R&D&I scheme, the Innovationbox, and in particular on its use by various categories of firms.¹⁸³ A report ordered by the European Commission by a consortium led by the Netherland Bureau for Economic Analysis (CPB) has looked systematically at fiscal R&D schemes and a.o. made a benchmark of 83 schemes in over 30 countries.¹⁸⁴ The three Dutch schemes included in the benchmark WBSO, RDA and Innovation box scored a 5th, 13th and 44th place on the overall ranking. The overall ranking was based on several indicators related to scope, targeting and the responsible organization.

The annual overview of total investments in science and technology (TWIN) also presents a detailed estimation of the share of innovation expenditures in the Netherlands.¹⁸⁵ The report states that R&D and innovation are increasingly aligned with each other (both in the spheres of policy and practice), but that is not reflected in the planned budget adaptations. The table below provides the direct and indirect budgets for the period 2014-2020.

Table 8: Estimated direct and indirect public budgets for R&D&I, 2014-2020 (in €mln and as a % of GDP). Source: TWIN 2014-2020.

	2014	2015	2016	2017	2018	2019	2020
Expenditure on R&D	4.873,8	5.020,2	4.861,5	4.737,5	4.660,2	4.657,1	4.682,2
- out of which relevant for innovation	1.136,5	1.215,9	1.125,9	1.097,2	1.084,4	1.073,3	1.092,2
Expenditures on innovation (not being R&D)	139,3	261,2	181,0	195,5	197,6	173,4	161,4
Fiscal instruments for R&D&I (Excl. Innovation Box)	1.045,7	1.042,8	1.153,8	1.130,9	1.130,9	1.131,0	1.128,0
Total direct and indirect R&D&I	6.058,9	6.324,1	6.196,2	6.063,9	5.988,8	5.961,5	5.971,6
As a percentage of GDP							
Expenditures on R&D&I as a % of GDP (excluding fiscal instruments)	0,76	0,78	0,72	0,69	0,67	0,64	0,63
Expenditures on R&D&I as a % of GDP (including fiscal instruments)	0,91	0,93	0,88	0,84	0,82	0,80	0,78

183 See letter of the secretary of state of the Ministry of Finance on the use of the Innovationbox 2010-2012, dd. 13-01-2015, kenmerk AFP/1117/U. In Dutch.

184 European Commission's DG for Taxation and Customs Union (November 2014), A Study on R&D Tax Incentives. Final report, Taxation papers, Working paper no. 52 – 2014, CPB in consortium with CAPP, CASE, CEPIL, ETLA, IFO, IFS, HIS, European Union, Luxembourg.

185 Rathenau Institute (April 2015): Total Investment in Research and Innovation 2013-2019.

3.6 Business R&D

3.6.1 The development in business R&D intensity

BERD expenditure and BERD intensity experienced a drop in the Netherlands in the wake of the crisis followed by a sharp increase in 2011. As shown in Figure 10, especially BERD in the service sector increased so that the share of the service sectors (G-N)¹⁸⁶ increased from 24 to 36 % of BERD between 2008 and 2013. This sudden rise may be partially due to government efforts, including R&D tax incentives and incidental additional support for business R&D by the government. Another potential and plausible reason is a revision of statistical methodology in 2011, due to which companies with less than 10 employees are included. As a result, where the reported R&D expenditure of small companies in 2010 amounted to 10% of total R&D expenditures, in 2012 this was almost 21%.¹⁸⁷

The biggest funder of business R&D is business itself at 84% of BERD. Direct government support for business R&D peaked in 2010, but decreased since to 2,0% in 2014. Together with funding from abroad at 14% total non domestic business funding of BERD remains below 20% (see figure 2). What is not taken into account in Figure 11, however, is the substantial indirect support the Dutch government provides to BERD in the form of tax incentives (see public funding semester report 2015). For 2011, the OECD indicated that 75-80 % of real public support to business R&D came in the form of tax incentives.¹⁸⁸ The amount of foregone tax revenues are thought to have increased substantially since that year: i.e. the Eurostat figures on government support for private sector R&D are a considerable underestimation of the "real" share of BERD funded (directly or indirectly) by government.

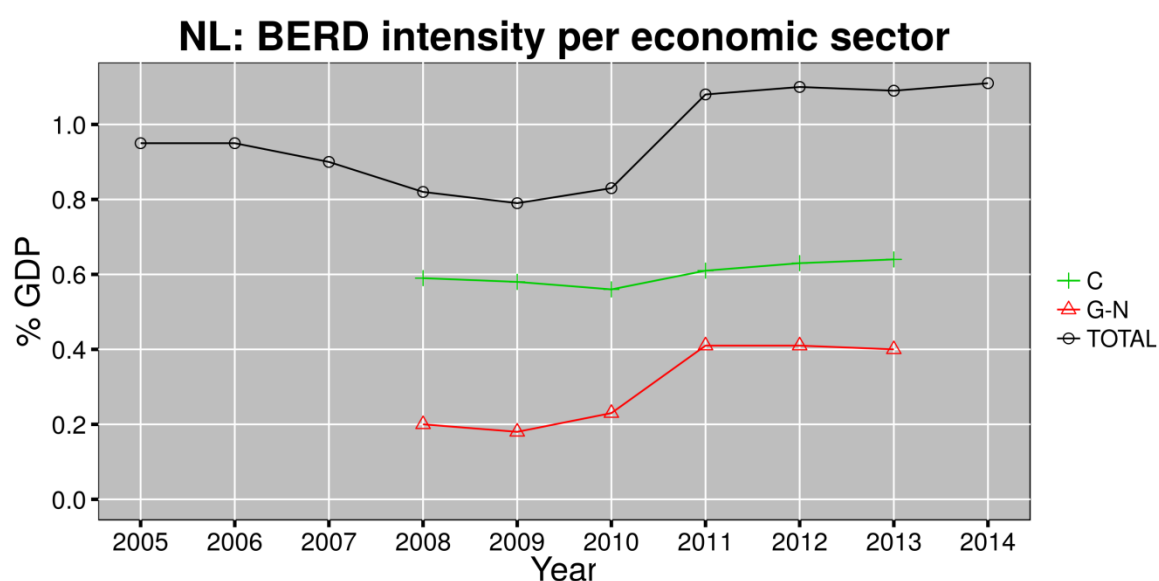


Figure 10: BERD intensity broken down by most important macro sectors (C= manufacture, G_N=services).

¹⁸⁶ The service sectors G, Wholesale and retail trade; repair of motor vehicles and motorcycles, H Transportation and storage; I Accommodation and food service activities; J Information and communication; K Financial and insurance activities; L Real estate activities; M Professional, scientific and technical activities; N Administrative and support service activities

¹⁸⁷ http://dialogic.nl/documents/other/wti2_resume.pdf

¹⁸⁸ OECD STI Scoreboard 2013. OECD STI Outlook 2014. CPB Netherlands Bureau for Economic Policy Analysis, 2014, A Study on R&D Tax Incentives Annex: Country fiches DRAFT FINAL REPORT, European Commission, DG Taxud

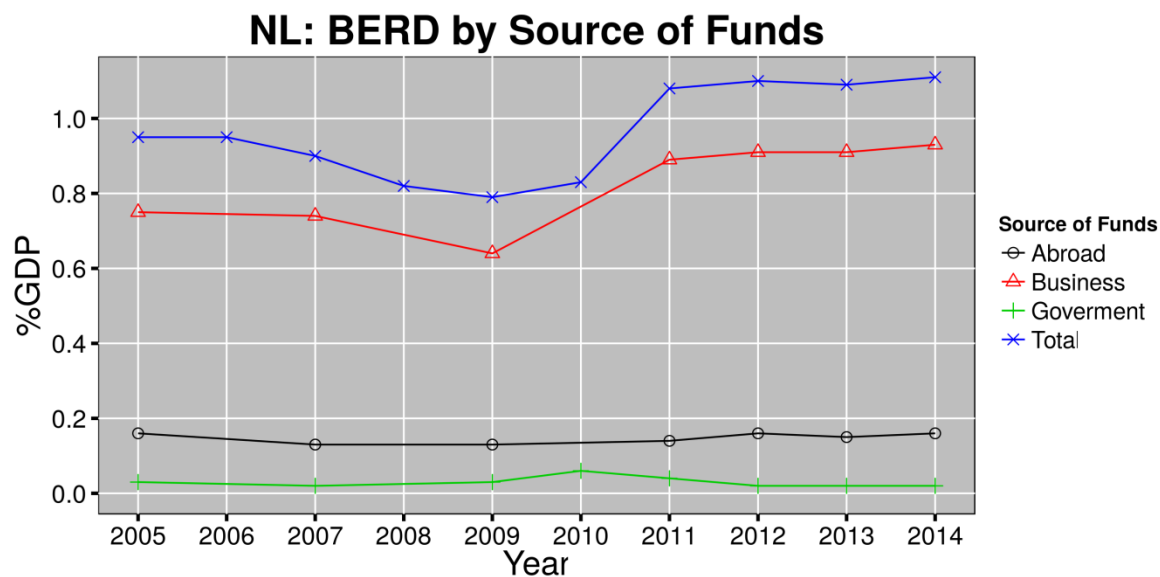


Figure 11: BERD by source of funds

3.6.2 The development in business R&D intensity by sector

As shown in Figure 10 the manufacturing sector still accounts for a larger share of BERD than the service sectors. The manufacturing sectors still account for the largest share of BERD. Absolute levels of BERD in the manufacturing sector have also increased since 2010. However the service sectors G-N have increased their levels of BERD more rapidly in this period (potentially in part due to the accounting issues raised in section 3.6.1) so that the manufacturing sector in 2013 accounted for 59% of total BERD and the sectors G-N¹⁸⁹ for 37% (from 22% in 2009).

C25-C30¹⁹⁰ account for the largest share of BERD, and in particular sectors C28: Manufacture of machinery and equipment and C26 (Manufacture of computer, electronic and optical products). Some of the larger companies included in these fields are Philips, ASML, and NXP as well as the surrounding suppliers and SME companies in the Eindhoven Brainport cluster and the Netherlands more broadly. These firms are ranked 21st, 41rd and 65th respectively on the European Industrial Innovation Scoreboard.¹⁹¹ STMI electronics (ranked 26th in the scoreboard) has its administrative headquarters in the Netherlands, but appears to do relatively little R&D here. The ranking of Dutch R&D performers may change, since R&D expenditures in Philips (still over 700 million) are decreasing while they are growing rapidly in ASML. In 2014, ASML invested more in R&D than Philips according to national sources.¹⁹²

BERD in C20 (chemical sector) decreased. In the case of the chemical sector this is perhaps surprising as the Netherlands is characterised by a strong chemical sector with large companies such as DSM and AKZO-Nobel (ranked 57th and 82nd in the European industrial R&D scoreboard respectively).

¹⁸⁹ The service sectors G, Wholesale and retail trade; repair of motor vehicles and motorcycles, H Transportation and storage; I Accommodation and food service activities; J Information and communication; K Financial and insurance activities; L Real estate activities; M Professional, scientific and technical activities; N Administrative and support service activities

¹⁹⁰ C25, Manufacture of fabricated metal products, except machinery and equipment; C26, Manufacture of computer, electronic and optical products; C27, Manufacture of electrical equipment; C28, Manufacture of machinery and equipment n.e.c.; C29 Manufacture of motor vehicles, trailers and semi-trailers; C30 Manufacture of other transport equipment

¹⁹¹ <http://iri.jrc.ec.europa.eu/scoreboard.html>

¹⁹² <http://www.technischweekblad.nl/top-30-r-d-asml-stoot-philips-van-de-troon.366684.lynkx>

This may be due to the cyclical nature of industry in this sector in which revenues decrease relatively rapidly in times of crisis, due to which, there can be relatively little room for investment in R&D. Also both large firms do a substantial amount of their R&D outside the Netherlands.¹⁹³

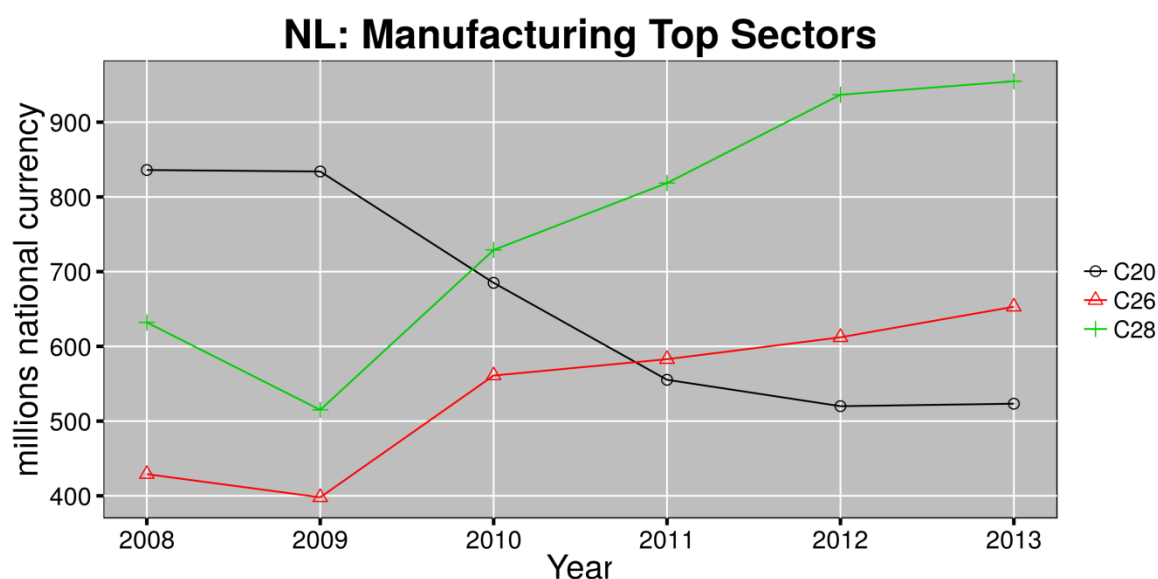


Figure 12: top sectors in manufacturing R&D data (C26=manufacture of computer, electronic and optical products; C20= Manufacture of chemicals and chemical products; C28=manufacture of machinery and equipment n.e.c).

There was a large increase as well in the BERD of the service sectors from 2009 to 2013. Services constitute a large share of the Dutch economy. However, firms in service sectors tend normally to invest less in formal R&D than the firms in the manufacturing sectors, though the difference between BERD in the manufacturing and service sectors is decreasing. Still, as is shown in the Figure 13, the amounts spend in BERD are substantial and increasing during the period studied. Especially the BERD in M (professional, scientific and technological activities) increased rapidly. Firms in this sector include a number of medium sized engineering consultancy firms such as Arcadis and Royal HaskoningDHV which are among the top 30 Dutch R&D performers.¹⁹⁴ BERD in J (information and communication) and G (Wholesale and retail trade) increased between 2008 and 2013 though the last years saw a mild decrease in BERD. This in contrast to the M sector, where BERD continued to increase in 2013 following a small decline in 2012. Wholesale and retail trade (G) is a well- developed sector in the Netherlands, with for example Ahold ranked 269 in the European Industrial R&D scoreboard.¹⁹⁵ The post crisis period saw a further process of concentration (Mergers and Acquisitions) in the retail sector – this year followed by a merger between large Dutch and Belgian supermarket chains (Ahold and Delhaize).

¹⁹³ <https://www.technischweekblad.nl/upload/documents/tinyMCE/RD-Top-30-2015.pdf>;

<http://www.technischweekblad.nl/Uploads/2014/4/Top-30-Bedrijfs-R-D-2014.pdf>

¹⁹⁴ <http://www.technischweekblad.nl/Uploads/2013/4/09-TW14-15-Tabellen.pdf>

¹⁹⁵ <http://iri.jrc.ec.europa.eu/scoreboard.html>

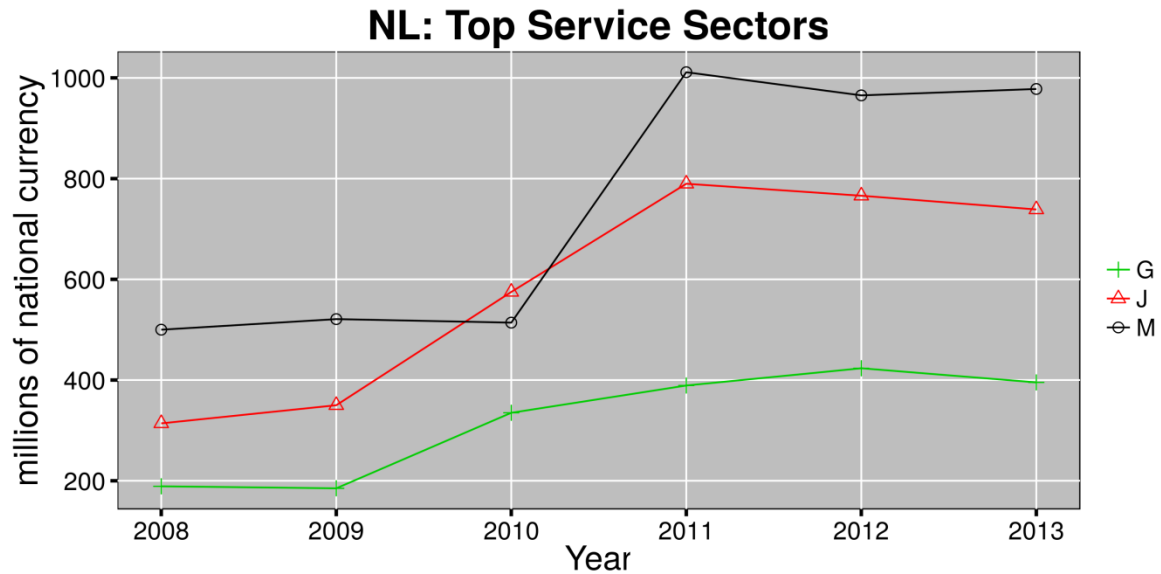


Figure 13: R&D expenditures in top service sectors (J=information and communication, G=wholesale and retail trade; repair of motor vehicles and motorcycles, M=professional, scientific and technical activities).

3.6.3 The development in business R&D intensity and value added

The manufacturing sector (see table in annex) accounts for a smaller share (12.6%) of Dutch Gross Value Added than in the EU 28 average of 15.2%. The top 6 sectors in decreasing order are 1) manufacture, 2) wholesale and retail trade; repair of vehicles and motorcycles, 3) Human health and social work activities, 4) Financial and insurance activities, 5) Public administration and defence; compulsory social security, 6) Real estate activities. As can be seen from Figure 14 the GVA levels of the manufacturing and trade sectors are comparable.

The level of Dutch Manufacturing GVA is below the EU-28 levels whereas the Trade GVA is higher. The health sector has a relatively high GVA as does the financial sector. However, Dutch banks had a difficult period following the financial crisis (the take over and split up of ABN followed by a forced nationalisation of the "Dutch" part which had been acquired by Fortis; the rescue of ING and some other banks, the loss of the AAA status and the Libor scandal by Rabobank etc). ING and the Rabobank rank 148 and 241 in the European Industrial R&D scoreboard and are therefore still among the top 15 Dutch companies on this list.

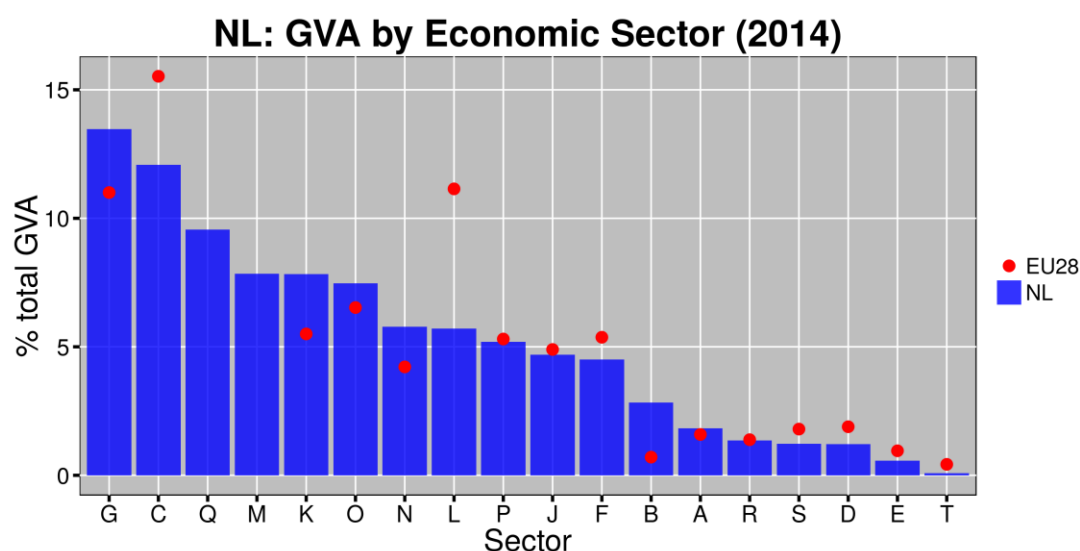


Figure 14: economic sectors as percentage of the total GVA.

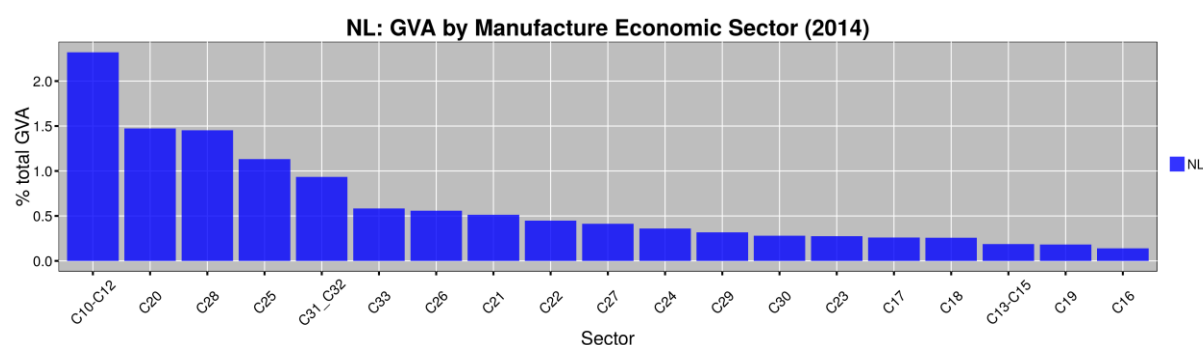


Figure 15: GVA in manufacturing.

The top 6 manufacturing sectors in terms of value added are: 1) Manufacture of food products; beverages and tobacco products (C10-C12), 2) Manufacture of chemicals and chemical products (C20); 3) Manufacture of machinery and equipment n.e.c. (C28), 4) Manufacture of fabricated metal products, except machinery and equipment (C25), 5) Manufacture of furniture; other manufacturing (C31-32); 6) Repair and installation of machinery and equipment (C33).

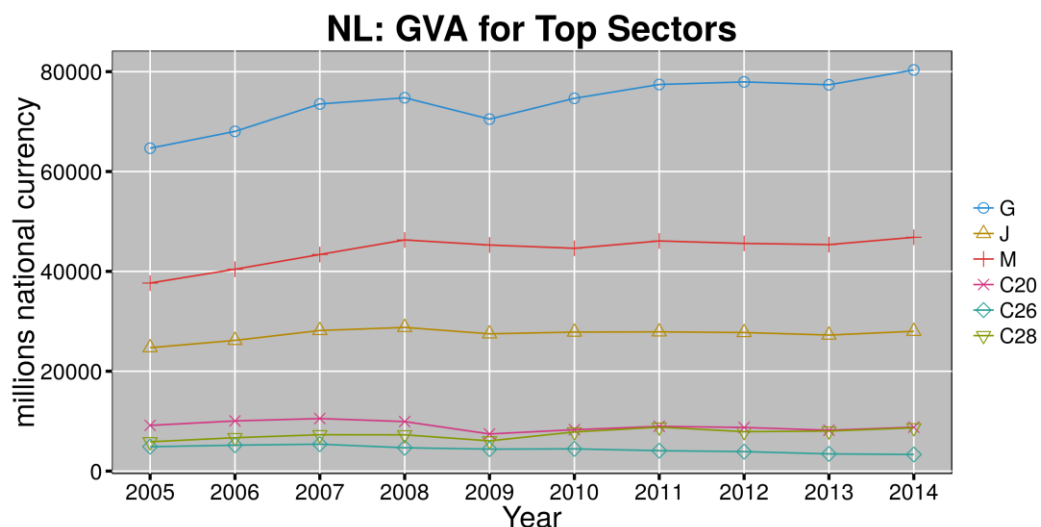
The Netherlands hosts a number of large multinational food companies a field in which it is a global leader, including some of the world's largest dairy firms, the Dutch-British Unilever, Heineken, foreign affiliates of some large American firms and, at least until recently a sizeable tobacco industry. The food sector is traditionally not characterised by high levels of R&D, which explains why while it features prominently in the GVA figure it is not represented in the figure on the Top 3 economic sectors in terms of BERD. The Chemical industry (C20) is also well represented in the Netherlands with multinationals like AkzoNobel and DSM. For both these sectors GVA is well above the EU 28 average.

This is not the case for C28: the manufacture of machinery and equipment and C26: manufacture of computer, electronic and optical products. The R&D intensity in these sectors increased substantially so that they are now the largest R&D performing manufacturing sectors in the Netherlands (the service sector M professional, scientific and technical activities had a higher BERD in 2013).

As shown in Figure 16, the service sector G (Wholesale and retail trade) have more or less recovered to pre-crisis levels. This is not fully the case for the J (information and communication) and especially the M sector (professional, scientific and technological services). Sector M had a peak in 2008 after which it declined until 2013. It remains well above 2005 levels though. Considering the modest recovery it is striking that the R&D intensity in these sectors (see Figure 12) has increased considerably since 2010. For the manufacturing sectors analysed, C20 (Manufacture of chemicals) is around pre-crisis levels, whereas C26 (Manufacture of computers) and C28 (Manufacture of machinery and equipment) have surpassed these levels to a considerable extent.

In terms of the number of scientists and engineers we observe that the manufacturing sector saw a 38% increase in the number of scientists in engineers between 2008 and 2014. In the case of wholesale and retail trade the increase was even more pronounced with +138%, though it still employed around half of the number of scientists and engineers as the manufacturing sector. The C (manufacturing) and G (Wholesale and retail trade) sectors studied went down in total employment and both thus saw an up-skilling of their labour force. The professional, scientific and technical activities sector saw a drop in S&E employment following the crisis, but surpassed its pre-crisis levels in 2013 and 2014. This sector M (professional, scientific and technical activities) still employs 39% more S&Es than the manufacturing sector as a whole. Considering the importance of labour in total R&D costs, the uptake in the hiring in R&D staff reflects the BERD trends.

Large MNCs are important players in the Dutch economy. In terms of value added it is not so much the large number of companies with their administrative headquarters in the Netherlands (e.g. Airbus, STMI electronics), but the large firms which maintain production as well as R&D facilities in the Netherlands. The reliance on large MNCs does result in some longer term threats to the Dutch economy posed e.g. to the potential outsourcing of production and R&D to other locations in the future.



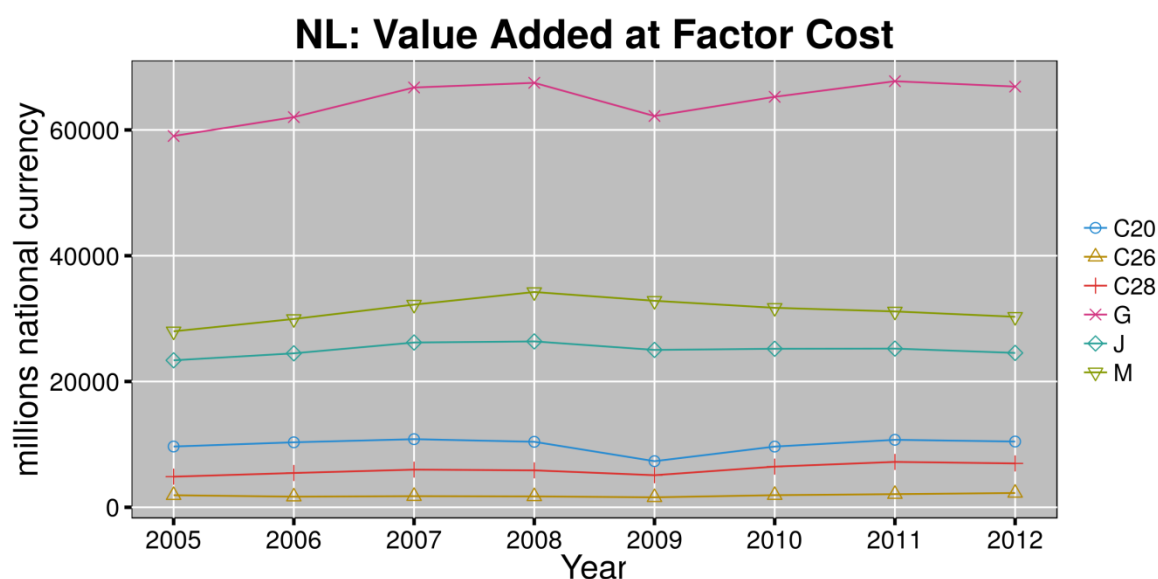


Figure 16: value added (GVA and at factor cost) for the leading (in terms of BERD) manufacture and service sectors (millions)

3.7 Assessment

Although public nor private R&D funding is known to be high in the Netherlands, the R&D system is commonly believed to be efficient when also taking into account the output that is achieved through those R&D activities. The Dutch government itself stresses the success of its R&D&I strategies by pointing at improvements on rankings like the Global Competitiveness Index (WEF) and the Innovation Union Scoreboard (EU). On both rankings the Netherlands are currently listed as 5th, as opposed to the 8th and 6th position (respectively) one year earlier. The Global Innovation Index 2015 (Cornell/WIPO) even ranks the Netherlands in 4th place, also one place higher than in 2014. Of course it is hard to assess whether these improvements really result from policy changes. Some aspects of the system are in fact being criticized for their negative consequences. This concerns for instance the reorganization as well as allocation procedures of NWO. As for the latter, the Dutch funding system is increasingly oriented towards applicability of results, which has been causing a debate with respect to whether there still is sufficient room for fundamental and ‘free’ (instead of thematically oriented) research.¹⁹⁶ Also, a recent study shows that, apart from the fact that beta sciences are receiving less funding from general university funding over time, the number of fte has increased in all disciplines in the period 1997-2014.¹⁹⁷ As the NWO budget has not kept up with this trend of expansion, the approval rate of proposals has been dropping. A related point of discussion is the allegedly overly strong focus on quality: although it is appreciated that the best researchers get the best chances, the percentage of research proposals actually being awarded is criticized for being on the low side while application procedures are perceived (by academics) as highly labor intensive.¹⁹⁸ A similar development can be found in the protests against universities being managed from a very narrow efficiency perspective.

¹⁹⁶ See, for instance: KNAW (August 2015). [Room for unrestricted research](#). In Dutch

¹⁹⁷ Rathenau Institute (March 2016). [Chinese borden - Financiële stromen en prioriteringsbeleid in het Nederlandse universitaire onderzoek](#).

¹⁹⁸ Van Calmthout (March 2015). [Allocation of research funding has to change](#). Volkskrant. In Dutch.

When it comes to business R&D, the majority of funding in the Enterprise Policy is made available through instruments that reduce the costs of R&D (rather than directly providing subsidies). So far there is no solid evidence whether this truly results in increases in private R&D.

A recent meta-analysis of innovation and entrepreneurship interventions showed that the Dutch policy mix on this account is robust, but policy rationale and especially empirical evidence for the effectiveness and efficiency of some measures is missing.¹⁹⁹ An international comparison of R&D&I tax schemes, accounting for most of the innovation budget, did not point at strongly increased business expenditures.^{200, 201} The fact that the government is decreasing her support for innovation implies that the absolute basis for leveraging private R&D expenditure is getting smaller. These budget cuts are paired by two notable changes in the funding system. One of them consists of intensified efforts to improve internationalization of the Dutch economy and to attract foreign funding. In fact, the Top Sector approach is to a large extent an attempt to put the strongest economic activities in the spotlights internationally. This strategy might lead to increased availability of FDI, but also aims to support commercialization of Dutch knowledge and innovation. The second notable change is the strong focus on public-private collaboration (e.g. through TKI-allowance, which has the potential of reducing two perverse incentives: not only does it reduce risks of deadweight losses of subsidies, but guiding private R&D in certain directions can also help to steer business away from environmentally unsustainable innovation towards societally desirable directions. Another concern nowadays, expressed by for instance VNO-NCW and MKB Nederland, is that the current budget cuts might damage the continuity of research and innovative activities.²⁰²

¹⁹⁹ Dialogic (May 2015). [Evaluation Innovation and Entrepreneurship Policy Mix](#) (article 12/13) 2009-2013. In Dutch.

²⁰⁰ CPB (June 2015). [More R&D with tax incentives? A meta-analysis](#).

²⁰¹ Koopmans & Donselaar (2015). [A meta-analysis of the effect of R&D on productivity](#). ESB. In Dutch.

²⁰² MKB Nederland (June 2015). [Budget cuts can damage industry policy](#). In Dutch.

4. Quality of science base and priorities of the European Research Area

4.1 Quality of the science base

In a European benchmark by the European Commission DG RTD (see table below), the Dutch science base is above-average up to rather strong. The Netherlands rank 7th when considering the number of publications per thousand inhabitants, and 6th when this is done based on fractional instead of full counting. Countries like Switzerland, Iceland and Denmark score considerably better with the first one having 4.5 publications per thousand of population (versus 2.89 in the Netherlands). A similar result emerges when looking at the share of international co-publications, where the Netherlands have the 9th position. Like on the previous measure, variation between the European countries is relatively large. The European average of 36.4% is still well below the Dutch 54.7%. As the number of international publications is a measure similar to the ones mentioned above, the Dutch performance on this account is again in the league between the top and the average (8th position).

While all these indicators merely stress the relative quantity of scientific output, the percentage of publications in the top 10% of most cited publications tells something about the actual quality of the science base. Traditionally the Netherlands have been scoring fairly high on this account. The 15.3% observed in 2000 was just below Switzerland's top 1 position resulting from having 16.3% of the most cited publications. By 2010, the Netherlands even achieved the highest position when looking at publication share based on fractional counting. Taking the average over the period 2000-2013, the Netherlands rank behind Switzerland and Iceland (full counts). A 3.6% share of public-private co-publications (2011-2013) implies a top-3 position as well, this time behind Denmark and again Switzerland. To what extent this performance can be sustained remains still to be seen, as the termination of the Economic Structure Enhancement Fund (FES; see discussion in section 1.1) and recent consolidation programs increase pressure on the budgets available for science. As noted in the latest TWIN-figures, however, government expenditure on university research and other non-application-oriented research will increase slightly over the next few years. Budget cuts concern in particular funding for applied research.

Overall, the indicators show that the quality of the science-base is well-maintained. The strong reputation of Dutch research was in fact one of the main reasons to establish the Enterprise Policy strategy, aimed at making better use of all the available expertise (see section 2.1). Characteristic about recent developments in the science domain is also that doubts regarding the quality hardly occur. Most discussions concern the quality of education (see for instance the AWTI advice on the interweaving of higher education and research²⁰³) and the downsides of allocating funding to only a very select number of excellent researchers.²⁰⁴

²⁰³ AWTI (2015). [Interweaving of research and higher education. Unity in diversity](#). In Dutch.

²⁰⁴ Volkskrant (February 2015). [Top researchers collection millions of research funding per person](#). In Dutch.

Table 9: Main indicators for quality of the Dutch science base²⁰⁵

Indicator	Year	Netherlands	EU average
Number of publications per thousand of population (full)	2013	2,89	1,43
Share of international co-publications	2013	54,7%	36,4%
Number of international publications per thousand of population	2013	1,58	0,52
Percentage of publications in the top 10% most cited publications (full)	2000-2013	16,78%	11,29%
Share of public-private co-publications	2011-2013	3,6%	1,8%

4.2 Optimal transnational co-operation and competition

4.2.1 Joint programming, research agendas and calls

The Dutch government supports international research co-operation in a number of ways. The Ministry of EA encourages both public and private parties to participate in Joint Technology Initiatives (JTIs), notably ECSEL (previously ENIAC and ARTEMIS). The budget for international innovation also involves participation in EUREKA-clusters. Note that this concerns co-funding schemes. The budget available for JTI and EUREKA together is €33mln in 2015, increasing to €40mln as of 2017 (more or less evenly spread over both initiatives).²⁰⁶ Another €11mln (2015) to €18mln is available as co-funding for the European Eurostars-program. The Dutch government also supports participation in international organisations like ESA, ESO, CERN, EMBL and EMBC. Of major importance for international research collaboration is also the creation of (and access to) large-scale research facilities. In 2014 it was announced that the Dutch government is investing €140mln in joint research facilities for European space travel, as well as an additional €13mln annually from 2018 onwards.²⁰⁷

Also the NWO and KNAW instruments are of importance for joint research activities such as developing research agendas. As they are in charge of allocating most of the competitively assigned research funding, their participation in platforms like Science Europe and the Global Research Council ensures that research is being aligned with international research efforts.²⁰⁸

²⁰⁵ Source: based on Scopus data analysed by Sciencemetricx in a study for the European Commission DG RTD. The share of public-private co-publications is downloaded from the Scival platform and is also based on Scopus data. (Scival © 2016 Elsevier B.V. All rights reserved. SciVal® is a registered trademark of Reed Elsevier Properties S.A., used under license). The data on public-private co-publications differs from the data included in the IUS, due to differences in the methodology and the publication database adopted.

²⁰⁶ Ministry of Economic Affairs (October 2014) – [Response to questions on EA's Budget 2015](#). In Dutch.

²⁰⁷ Ministry of Economic Affairs (February 2015). [Netherlands Invests €140 million in European Space Programme](#)

²⁰⁸ NWO (February 2015). [International collaboration](#)

Important for research programming in the Netherlands is also the Science Vision 2025, released in November 2014, which takes joint research agendas into account as well.²⁰⁹ As noted at several instances in this report, the National Research Agenda was developed according to a massive multiple-step joint programming approach (involving public consultation in various ways, both on- and offline).

The research funding available in the Netherlands is increasingly designated to topics also having priority in other countries. By linking up with the Horizon 2020 program, the R&I policy automatically addresses challenges and developments taking place at the European level. As of 2015, €50mln euro is made available annually for both fundamental and applied research institutions that are applying for Horizon 2020 funding.²¹⁰ Also within the individual Top Sectors, public and private stakeholders (including the TKIs) representing a certain knowledge domain ensure they coordinate their research efforts with other countries. This thereby impacts the total amount of expenditure devoted to international cooperative research, as the parties involved in the TKIs are also eligible to instruments like the TKI-allowance. Finally, the themes focused on by NWO are also chosen with internationally important research areas in mind.²¹¹ gain, these are predominantly societally important themes like healthcare and energy.

As for (ex-post) evaluation procedures for international research collaboration; this is a standard procedure in most of the NWO and KNAW instruments. All funding provided by these research councils is subject to international peer review assessment. NWO and KNAW also have several collaboration agreements for supporting visits, joint workshops and research projects, but without predefined priorities.

All of the mentioned interventions have relevance for alignment between national and international (European) research initiatives. The NWO and KNAW are most important when it comes to embedding international research priorities in a national competitive scheme. Procedures regarding definition of priorities, selection decisions, reporting requirements, eligibility criteria, definition of eligible costs, intellectual property rights, standards for proposal evaluation, funding rates, etcetera can be found on their respective websites.

4.2.2 RI roadmaps and ESFRI

The first Dutch roadmap for large-scale research facilities was composed in 2008. 25 research facilities were selected, of which eight received €63 million in total. Every four years the roadmap is updated, while new financing rounds occur every two years.²¹² The most recent roadmap of 2012 included 29 facilities, of which eight received €82.5 million funding. In the latest financial round of 2014 these 29 facilities were given the opportunity to tender for another €81 million, which were granted to six research facilities. Every facility is granted a budget for a specific project.²¹³

Each project is based in the Netherlands but is linked to a European/intergovernmental counterpart. Multiple European Research Infrastructure Consortia (ERIC) are included in the most recent roadmap. The Netherlands has a high participation rate in different ESFRI-projects, of which the strategic value for the Netherlands is underlined. It is not possible for foreign projects to receive Dutch funding without substantial participation of Dutch parties, however.

²⁰⁹ Ministry of Education, Culture and Science (November 2014): [Science vision 2025](#). In Dutch.

²¹⁰ Ministry of Education, Culture and Science (October 2014): [€50 million for Dutch knowledge institutes when retrieving European research fund](#). In Dutch.

²¹¹ <http://www.nwo.nl/over-nwo/strategie/speerpunten+2011-2014/samenwerken+in+themas>

²¹² Ministry of Economic Affairs (2014). [Annotated Agenda for the Informal Competitiveness Council, 21st and 22nd of July 2014, Milan](#). In Dutch.

²¹³ Ministry of Education, Culture and Science (2014). [National Roadmap for Large-Scale Research Facilities, finance round 2013-2014](#). In Dutch.

The distinction between local and intergovernmental research infrastructures is not made in terms of budget.²¹⁴ In the latest finance round of 2013-2014, the bulk of the funding went to the “Physics, Astronomy, astrophysics and mathematics” domain. Other domains that received funding were Biological & Medical Sciences and Humanities & Arts.

As announced in the Science Vision 2025, a Permanent National Commission for Large-Scale Research Infrastructure has been appointed in 2015.^{215, 216} The Commission, appointed by NWO, is tasked with mapping all current large-scale research facilities accessible by Dutch researchers, as well as identifying which essential research facilities the Netherlands is currently lacking. In addition, it will look for opportunities to increase public-private cooperation with regard to new and existing large-scale research facilities. The work of the Commission will have a leading role in the new national roadmap for large-scale research infrastructure, scheduled for 2016.

The Commission’s task of mapping all current RIs also includes foreign and inter-governmental RIs to which Dutch researchers have access, in order to avoid the construction of new RIs that already exist elsewhere in Europe.

While an in-depth analysis of the quality of the national RI landscape is not possible without technical scientific knowledge within several domains, it can be stated that the Netherlands has multiple RIs in every domain which requires large-scale RIs. The Netherlands’ continuous and intensive monitoring and mapping of its research infrastructures suggests an adequate size and quality. Meanwhile, large-scale research facilities are evaluated on their potential for knowledge transfer and open access²¹⁷, and the Netherlands is very active in maintaining and initiating cooperation with foreign and pan-European research facilities. The openness to foreign access thus appears to be on a suitable level.

4.3 International cooperation with third countries

The Netherlands is actively involved in increasing international cooperation in research, development and innovation with third countries. According to the latest progress report on the ERA, the Netherlands spends 3.1% of its R&D budget on collaboration programs carried out with third countries, ranking fourth of all ERA Member States. Several measures exist that stimulate collaboration in research, which usually take the form of bilateral agreements.²¹⁸ Next to long-standing research cooperation with countries such as the U.S. and China, in the past years agreements have been set up or strengthened with emerging countries such as Brazil and India. The NWO Strategy 2015-2018 describes that these collaborations will be continued in the upcoming years.²¹⁹ The basis for cooperation with third countries consists of Memoranda of Agreements which form around specific themes.

A recent example is the strengthened cooperation between the Netherlands (IMDI NeuroControl) and the U.S. (Rehabilitation Institute of Chicago) for research on NeuroRehabilitation. The agreement also includes the appointment of seven Dutch visiting professors at the Northwestern University of Chicago.²²⁰ Last year, the U.S. and the Netherlands co-financed research related to cybersecurity.²²¹

²¹⁴ Ministry of Education, Culture and Science (2012). [Uncharted Frontiers: the Netherlands' Roadmap for Large-Scale Research Facilities](#). In Dutch.

²¹⁵ Ministry of Education, Culture and Science (2014). [2025. Vision for Science. Choices for the future](#).

²¹⁶ FOM (July 2015). [Permanent national commission for Large-scale Scientific Infrastructures](#).

²¹⁷ NWO (2015). [Call for proposals: investments NWO-large](#).

²¹⁸ EC (2015). [European Research Area. Facts and Figures 2014](#).

²¹⁹ NWO (2015). [NWO Strategy 2015-2018](#)

²²⁰ <https://www.utwente.nl/nieuws/2015/6/221734/nederland-en-amerika-verstevigen-onderzoekssamenwerking-naar-neurorevalidatie>

²²¹ <http://www.bits-chips.nl/artikel/vs-en-nederland-steken-samen-geld-in-cybersecurity.html>

The Netherlands has maintained scientific exchange programs with China for over 30 years. Moreover, research teams composing of Dutch and Chinese researchers can apply for funding from the Strategic Scientific Alliances program. Prerequisite is that the research team is affiliated to both Dutch and Chinese research institutions.²²²

Research collaboration with India focuses on ICT. In June 2015 NWO announced that together with the Indian Ministry of ICT it will invest almost €2 million for research projects on big data, Internet of Things and serious gaming, together with firms such as Honeywell and Tata. The projects will take four years, strengthen already existing research ties and match with the Top Sector policy, specifically those of top sectors HTSM and Creative Industry.

While the Netherlands already cooperated with India, China and the U.S. before these agreements, the research collaboration with Brazil announced in 2014 marks the start of a new partnership. The partnership concerns thirteen research projects regarding the Biobased Economy. NWO funds it for €3.75 million.²²³

The Netherlands distinguishes itself by also maintaining an intensive collaboration with Indonesia on scientific research, arising from the joint history the countries share. The Scientific Programme Indonesia – Netherlands stimulates long-term cooperation between Indonesian and Dutch research teams, adds to Dutch-Indonesian research networks and funds communication of scientific results to the Dutch and Indonesian public.²²⁴

Next to bilateral agreements with third countries, the Netherlands participates heavily in European multilateral innovation projects, which are also open for third country partners. In its first year, the Dutch parties received €537mIn from Horizon 2020. The Dutch government has made €50mIn available annually for fundamental and applied research institutions that are applying for Horizon 2020 funding. The Netherlands is also a prominent participant in Eurostars-2, ranking second among 34 countries. The success rate for Dutch proposals was 32%. The Dutch budget is approximately €18mIn per year.^{225,210}

The Netherlands appears to be involved in EU level cooperation efforts with regard to research collaborations with third countries, such as the coordination of the activities organized through the SFIC or the further development of the Multi-Annual Roadmaps for international coordination, documentation on this is limited. Dutch institutions such as EP-Nuffic, NWO and TNO are represented in most BILAT projects, however. Regardless of the limited documentation on the Dutch participation in EU level cooperation with third countries, it is thus deemed to be on a sustainable level.

4.4 An open labour market for researchers.

4.4.1 Introduction

In the Netherlands, individual institutions have a large amount of autonomy concerning staffing issues. Despite the fact that measures for active recruitment of researchers are scarce, the Dutch labour market is open to international R&D personnel (including academics).

²²² <https://www.knaw.nl/nl/internationaal/samenwerking-china>

²²³ <http://www.nwo.nl/actueel/nieuws/2014/cw/375-mln-voor-internationale-samenwerking-biobased-onderzoek-nederland-%E2%80%93-brazilie.html>

²²⁴ <https://www.knaw.nl/nl/internationaal/samenwerking-indonesie>

²²⁵ Ministry of Economic Affairs (2015). [Positive developments in the participation of Dutch SMEs in Horizon 2020](#).

For instance, NWO mobility grants encourages the international mobility of researchers, and all vacancies in the Dutch academic world are published on the international website Academic Transfer. Improvement of doctoral education is still in progress, and also the European Commission's [HR Strategy for Researchers](#) (incorporating the Charter & Code) is increasingly present.

The Netherlands holds almost 70000 doctorate holders. 20% of this population is no longer active in research, leaving approximately 55000 active researchers with a PhD, who represent almost 1% of the Dutch working population. While this has been different during the financial crisis, supply and demand in the Dutch labour market for researchers appears to be relatively balanced. In 2012, 95% of all researchers was employed, whereas only 3% was unemployed involuntarily.²²⁶ Moreover, in December 2014 a new collective bargaining agreement for university employees was announced, which includes agreements for improving the labor market perspective of doctorate holders.²²⁷ In 2012 there were about 185000 professionally employed researchers in the Netherlands; 134123 of them were active for private companies, 13861 for public research institutes, and 37300 for higher education institutions. Relative to the total working population, the 185000 represent slightly over 2,5% of 7,215,000 professionals.²²⁸ Eurostat data on human resources in science and technology (HRST) indicate that the number of scientists and engineers in the Netherlands has been increasing significantly over the past few years: from 548,000 in 2010 to 763,000 in 2015 (these data do involve a couple of breaks in time series, however).²²⁹ Furthermore, Eurostat data on job vacancy statistics for researchers in professional, scientific and technical activities (NACE M) amount to 13300 compared to a total of 485,000 of occupied jobs in this particular sector (2015 figures).

4.4.2 Open, transparent and merit-based recruitment of researchers

As individual institutions have a high level of staffing autonomy, procedures regarding employee recruitment vary. Various universities apply the recruitment code of the Dutch Association for Personnel Management & Organisation Development (NVP). In addition, the growing number of universities that has obtained or is applying for the 'HR Excellence in Research' is an indication that the recruitment of researchers in the Netherlands is relatively transparent and merit-based. Indeed, many vacancies at universities that are currently active appear to fulfil most criteria for Transparent, Open and Merit-based recruitment. The only criteria that seem to be missing frequently are those concerning the composition of selection panels. In addition, the existence of AcademicTransfer helps with providing applications with a transparent and complete picture of available research vacancies. Detailed figures about academic employment and career development are presented regularly by the Rathenau Institute.²³⁰

Inflow of foreign researchers (as well as students) is explicitly being supported in the Netherlands, for instance through the [Knowledge Migration Program](#) (providing working permit and immigration possibility)²³¹ and through the 30% tax ruling (giving immigrants with a specific expertise a 30% tax-exemption).²³²

²²⁶ Dutch Bureau of Statistics / CBS (December 2014). [Careers of doctorate holders in the Netherlands](#)

²²⁷ VSNU (February 2015). [Collective Bargaining Agreement Dutch Universities](#). In Dutch.

²²⁸ Dutch Bureau of Statistics / CBS (February 2015). Statline data: Research & Development.

²²⁹ Eurostat: Employed HRST by category, age and occupation. Accessed at 08-10-2015.

²³⁰ See, for instance: De Goede, M., Belder, R., De Jonge, J. (2013), *Feiten en Cijfers Academische carrières en Loopbaanbeleid*; and De Goede, M., Belder, R., De Jonge, J. (2014), *Promoveren in Nederland. Motivatie en loopbaanverwachtingen van promovendi*. In Dutch.

²³¹ Immigration and Naturalisation Service (February 2015). [Highly skilled migrants](#)

²³² Exact conditions are provided on the [website](#) of the Tax and Customs Administration Office: Tax and Customs Administration Office (February 2015). [Expertise requirement](#).

According to the Science Vision 2025, the attractiveness of the Dutch research system will also be promoted by bringing researchers on international (trade) missions.²³³ In July 2014, the Ministry of ECS informed parliament about studies and efforts on attracting highly qualified immigrants. A report by the European Migration Network (EMN) noted the uniqueness of the Dutch approach when it comes to differentiating salaries according to the age of knowledge migrants: this is supposed to attract also younger generations (and maintain them by offering salary development opportunities).²³⁴ However, in general the Netherlands only have an average performance when it comes to attracting highly educated knowledge workers. The Netherlands rank 12th on the Global Talent Competitiveness Index published in January 2015.²³⁵ The average performance is confirmed in a study by the Dutch Research and Documentation Centre (WODC), stating that the policy for highly educated employees only served to maintain knowledge immigrants already present in the Netherlands.²³⁶ The status and results of interventions aimed at attracting foreign talent are being registered in the 'Monitor knowledge migrants' of the IND Information and Analysis Centre. It concluded in an evaluation that on an annual basis 6000 knowledge migrants are being attracted via the knowledge migration program mentioned above. The evaluation found that stakeholders and participants appreciate the program, but would welcome more flexibility. The fact that companies need to be registered as a referent (which costs €5000) was mentioned as a discouraging factor (especially for SMEs), and also the fact that not all information is available in English is experienced as a barrier.

Finally, as for the labour market of researchers, section 3.2 describes how the domain of education and science was spared from budget consolidations related to the financial and economic crisis. Nevertheless, the Science Vision 2025 (in particular its section 3.3) notes that salary issues are no primary concern when attracting talented foreign researchers.²³⁷ More important are the academic qualities and available research infrastructures foreign researchers can find in the Netherlands. Plans to increase attractiveness of the Dutch labour market for researches therefore include better scientific profiling, which is one of the elements also included in the performance agreements between the Ministry of ECS and the universities. Section 3.4 in the Science Vision presents plans to strengthen career opportunities for researchers. These include intentions to further differentiate between different types of PhD-trajectories, e.g. combined with a position in industry, or with a teaching degree. Another plan is to decrease the reward for PhD degrees, in order to reduce the incentive for universities to hire many PhD-students and few (permanent) professors.

4.4.3 Access to and portability of grants

The portability of grants is relatively well arranged in the Netherlands, as the international mobility of researchers is encouraged via a range of grants and fellowships designed to promote international cooperation between Dutch researchers and researchers of different nationalities. For instance, the grants of the NWO (Dutch Organisation for Scientific Research), such as the NWO-Talent Scheme ("vernieuwingsimpuls"), are transferable to a new institute if a grant laureate decides to continue his or her research in a different European country. Particularly noteworthy in this respect is NWO's participation in the 'Money follows researcher'-scheme, which allows researchers to bring their funding when moving from one European knowledge institution to another.²³⁸ The MfR-scheme only holds for a selection of grants.

²³³ Ministry of ECW (2014). 2015. [Vision for Science. Choices for the future.](#)

²³⁴ European Migration Network (EMN), 2013. [Synthesis report and policy and best practices in the Netherlands](#)

²³⁵ Nuffic (February 2015) [INSEAD: Netherlands good at attracting talent](#) . In Dutch.

²³⁶ WODC (February 2015). [Wanted: foreign toptalent: Evaluation of the Regulation High Educated](#) . In Dutch.

²³⁷ Ministry of Education, Culture and Science (November 2014): [Science vision 2025](#). In Dutch.

²³⁸ NWO (February 2015). [Money follows researcher \(MfR-scheme\)](#)

With regard to the access to grants: the NWO's grants aimed at international cooperation allow researchers in foreign institutions to apply for grants, under the condition that they have cooperation with a research team in the Netherlands.

4.4.4 Doctoral training

According to the Dutch PhD student network ([Promovendi Netwerk Nederland](#)) a large number of PhD programmes is part of a national graduate school. These inter-university organisations offer professional courses to doctoral candidates, facilitate knowledge exchange and provide external supervisors to mediate any problems during the PhD programme. Not all fields of science have a national umbrella organisation. In this case, the organisation of the PhD programme is fully in the hands of a university-specific graduate school. Quality control used to be a responsibility of the Evaluation Commission Graduate Schools (ECOS) of the KNAW, but with the development of the latest Standard Evaluation Protocol (SEP) this has been moved to so-called SEP-commissions from 2015 onwards.²³⁹

The primary responsibility for the design and quality of (inter-university) graduate schools lies with the individual institutions. Universities that choose to offer a graduate school are also responsible for the funding. Based on recommendations of the VSNU (association of universities) and SODOLA (interest group for graduate schools), a guideline for reforming the funding of graduate schools was developed over the past years. An evaluation of April 2015, by VSNU and SODOLA, concludes that universities and graduate schools are using the guideline effectively.²⁴⁰ The interest for (participation in) inter-university graduate schools is currently rising, as noted in Science Vision 2025 and the performance agreements between ECS and universities.

Most of the Principles for Innovative Doctoral Training appear to be present in the PhD tracks available at Dutch research universities. Moreover, a next wave of top research schools will be funded, also linked to the Top Sectors and other implemented linked policies. However, not a single Dutch university appears to have explicitly stated (publicly) that it is actively following the Principles when setting up and running doctoral training programs.

4.4.5 Gender equality and gender mainstreaming in research

Women are underrepresented in Dutch academia. In 2015 only 17% of professors in the Netherlands were female, which is the lowest percentage of all European member states.²⁴¹ Several measures have been introduced to tackle gender inequality in research. One prominent initiative aimed at encouraging institutional change is the charter *Talent To The Top*, in which research institutions, firms and other organisations commit themselves to a set of measureable goals with regard to gender equality. The purpose of the charter is to stimulate the career development of female researchers by improving recruitment and selection procedures. Each participant is monitored yearly.²⁴²

Multiple financial measures exist that specifically target female researchers. The Dutch Organisation for Scientific Research (NWO), the Royal Netherlands Academy of Arts and Sciences and the Ministry for ECS have introduced Aspasia, Athena and FOM/v. Aspasia is a scheme to increase the amount of female academic lecturers who develop into senior lecturers or professors. The Athena program stimulates the appointment of female researchers as permanent academic lecturers in the field of chemistry. FOM/v is a subsidy that finances female postdocs for a temporary position of three years within the field of physics.

²³⁹ VSNU and SODOLA (January 2015). [Guide for quality control graduate schools](#). In Dutch.

²⁴⁰ VSNU (April 2015). [Evaluation guideline graduate school funding](#). In Dutch.

²⁴¹ LNVH (2015). [Monitor female professors 2015](#). In Dutch.

²⁴² VSNU (2012). [Achievements in perspective. Trend rapport universiteiten 2000-2020](#).

Besides financial schemes, NWO has introduced regulations ensuring that females are not disadvantaged due to stereotypes or inflexible requirements if applicants prefer to combine work and care.

These regulations are collected in the *NWO seeks female* handbook. Nonetheless, a bias against female applicants still seems to be present in NWO funding.²⁴³

Measures addressing gender imbalances in decision making processes are limited. While the Higher Education and Research Act describes how the appointment of university board members needs to take a gender balanced distribution of seats into account, the VSNU code (guidelines by the Dutch sector organization for universities) has no mention of gender equality.²⁴⁴ One initiative that does promote equal representation of women in the academic community is the Dutch Network of Female Professors (LNVH), which was established with help from the ministries of EA, ECS and NWO. No structural measures supporting the gender dimension research programs appear to exist.

4.5 Optimal circulation and Open Access to scientific knowledge

4.5.1 e-Infrastructures and researchers electronic identity

The harmonization of access and usage policies for research and education-related public e-infrastructures in the Netherlands is organized and stimulated by [SURF](#). SURF is the collaborative organisation for ICT in Dutch higher education and research. It facilitates collaboration between ICT professionals, within networks and collaborative knowledge-sharing projects in the area of ICT innovation, thus ensuring access to innovative internet and ICT facilities. An example of such an innovation is the participation of all Dutch higher education and research institutions in [Eduroam](#), which is a host network allowing students and staff members to access the wifi-connections of institutes other than their own. Since 2011, SURF also supports, develops and operates the national ICT infrastructure (e-infrastructure) for higher education and research ([SURFnet](#)). Other services include [SURFmarket](#) (aimed at providing students, lecturers and researchers with ICT products and services) and [SURFsara](#) ("supporting research by developing and offering advanced and sustainable ICT infrastructure, services and expertise", including computing services and cloud services). The funding for SURF, €108mln in 2013 (out of which €34.7 by Min. of ECS)²⁴⁵, is made available in accordance with the government's response to the advice by ICTRegie on ICT research infrastructures.

No information on measures with regard to the support of a federated electronic identity is available at present. Universities and higher education institutions are all still using separate, non-linked accounts. While challenges such as personal data security and digital identity tracking are high on the Dutch societal agenda, no specific steps have been taken with regard to the digital identity of researchers.

4.5.2 Open Access to publications and data

Since 2005, all Dutch universities, the Netherlands Association of Universities of Applied Sciences (previously Council for Higher Education), KNAW, KB and SURF have signed the Berlin Declaration. In a parliamentary document published in January 2014, the Dutch State Secretary for Education, Culture and Science stated that access to the results of publicly funded research should always be free of charge, in addition to stating his intention to roll out open access in the near future.²⁴⁶ Moreover, ECS's Science Vision 2025 (see 2.2) describes the ambition of the Netherlands for all research publications to be open access in 2024.

²⁴³ Van der Lee, R. & Ellemers, N. (in press). [Gender contributes to personal research funding success in the Netherlands. Proceedings of the National Academy of Sciences.](#)

²⁴⁴ LNVH (2014). [M/F distribution in boards at universities and academic hospitals.](#)

²⁴⁵ SURF (May 2015). [Annual report SURF 2014](#)

²⁴⁶ Ministry of Education, Culture and Science (2014). [About digitalisation in Higher Education.](#) In Dutch.

Since 2010, the NWO has been stimulating open access via, inter alia, the Incentive Fund Open Access, which provides funding to researchers who publish their research in an open access journal.²⁴⁷

Moreover, the KNAW stated in March 2011 that all KNAW-published research should be open access within 18 months after publication.²⁴⁸ Open access is currently the subject of strong debate but nonetheless making progress. In July 2015, the Dutch government made 550 datasets directly available for the general public. 300 other datasets are still in the pipeline.²⁴⁹ In September 2015, the current minister of ECS called out to Spinoza Prize winners to make their future work open access.²⁵⁰ After restarting negotiations halted in 2014²⁵¹, VSNU and Elsevier finally reached an agreement in December 2015. It was agreed that in 2018 30% of all Elsevier publications will be published fully open access ("gold open access").²⁵² In the same month NWO announced its decision to increase its effort with regard to open access. As of now, all publications funded by NWO are immediately published open effort.²⁵³

Narcis, the organisation that organizes central access of Dutch scientific information, currently provides access to approximately 780000 publications; 330000 of these are open access.²⁵⁴ Six Dutch universities can partially be categorized as "Gold", while four universities have "fully Gold" policies. One university can be categorized as "Green". According to a '[State-of-art analysis of OA strategies to scientific data](#)' (ScienceMetrix, 2014), commissioned by the European Commission, the Netherlands are amongst the countries with the largest numbers of open data strategies and datasets. Apart from scientific data, the government also provides access to other types of data via her [Dutch National Open Data platform](#).

²⁴⁷ NWO (2010). [Report about NWO Symposium 12 October 2010](#)

²⁴⁸ KNAW (February 2015). KNAW gives impulse to free accessibility of scientific information. In Dutch.

²⁴⁹ Ministry of the Interior and Kingdom Relations (July 2015). Analysis open data reveals 550 datasets.

²⁵⁰ ScienceGuide (September 2015). Secretary Dekker calls out for open access. In Dutch.

²⁵¹ VSNU (November 2014). Explanation with regard to media coverage on halted negotiations VSNU Elsevier.

²⁵² VSNU (2015). Q&A agreement with Elsevier

²⁵³ <http://www.nwo.nl/beleid/open+science/open+access+publishing>

²⁵⁴ Open Access News. Retrieved from www.openaccess.nl

5. Framework conditions for R&I and Science-Business cooperation

5.1 General policy environment for business

According to the World Bank's Doing Business 2015 index, the Netherlands rank 27th when looking at the overall ease of running a company.²⁵⁵ The table below shows the key indicators used for benchmarking business regulations. Starting a business, enforcing contracts, international trading and especially resolving insolvency are all regarded as well-organized. As for this last topic, commencement of proceedings and especially management of debtor's assets is something taken care of relatively well, contrary to reorganization proceedings and creditor participation in resolving insolvency. The average duration of bankruptcy proceedings is short with 1.1 year, compared to the OECD average of 1.7 years.

Table 10: Key indicators on Doing Business 2015 index for the Netherlands (WorldBank, 2015).

TOPICS	DB 2015 Rank	DB 2014 Rank
Starting a Business	21	18
Dealing with Construction Permits	100	99
Getting Electricity	90	84
Registering Property	58	59
Getting Credit	71	67
Protecting Minority Investors	94	91
Paying Taxes	23	23
Trading Across Borders	13	13
Enforcing Contracts	19	18
Resolving Insolvency	12	10

²⁵⁵ WorldBank (2015). Ease of Doing Business in the Netherlands.

An environment favouring innovative entrepreneurship generally hinges on two key elements: provision of incentives for experimentation, and removal of barriers that might herein occur. Legislation is one of the aspects being of major importance when creating an innovation-supportive environment. The Patent Act (Rijksoctrooiwet) is for evident reasons of relevance here, but also approaches like the Green Deal program. Green Deals are projects in which authorities make an agreement with societal stakeholders (businesses, civilians, local government, etc.) to take away bottlenecks when it comes to boosting sustainable growth.²⁵⁶ The role of the government in these Deals is not financial (as in funding projects), but involves improvement of regulations, support in innovative procurement, and certification. Although, the Green Deals fall under the responsibility of the Ministry of EA, many other authorities participate as well. Relatively few policies aim to support R&I by targeting the demand for new knowledge. Apart from the Green Deals and recently introduced [Health Deals](#), one could think of the Interdepartmental Programme for Biobased Economy²⁵⁷ (also striving for sustainable economy) and policies for innovative public procurement. These interventions are relatively unconnected to traditional supply side policies; there is no overall design in which both types of policies clearly complement each other. Generally, the idea is that demand side policies create awareness for a particular desirable development, and that parties involved find their own ways of getting value out of being involved in contributing to this development. Of course, they can rely on the supply side policies that are applicable to their situation.

5.2 Young innovative companies and start-ups

Startup activity in the Netherlands is being supported through several measures. In order to bring university knowledge to the market, consortia of academics and entrepreneurs can apply for the [Technology Foundation STW's Valorisation Grant](#) ('Take-off', as of 2014). This grant is designed to take start-ups like university spin-offs through different growth phases. The €19m of subsidies that was awarded to projects in the period 2004-2011 led to 47 successful start-ups, together having an annual turnover of €16.8m.

In the period 2005-2008, startups also used to be boosted via a Technostarter programme called '*Subsidy scheme Knowledge Exploitation*' (SKE). Many of the 18 locally oriented SKE-initiatives for technostarters have been continued as *Valorisation Programme* projects. The Valorisation Program subsidizes 50% of the costs of partnerships focused at knowledge valorization. In practice these are mainly incubation programmes aiming to facilitate knowledge transfer and the creation of university spin-offs. An example is Brightmove in the South-East of the Netherlands (follow up of the Incubator3+ programme), which brings together investors, universities, businesses and government. Other examples are programmes like Startlife (providing microcredits to student starters, as well as pre-seed funds and proof of concept funds for technostarters) and Technojump (Technosprong; platform in the South-Holland province which is uniting stakeholders and providing funding as well).²⁵⁸ Another part of the Technostarter programme that is still being continued is the *Business angel program* (BAP). This instrument is designed to bring entrepreneurs and business angels in contact with each other, for instance via the [Business Angel Network](#) (BAN).

Policy measures explicitly focused on creation and development of young innovative enterprises also include funding instruments like *SEED Capital* (formerly Technostarter), the *Early-stage-funds* (VFF), the *SME loan guarantee scheme* (BMKB), *Microfinance*, and the *Growth facility scheme*. These are all described in detail in section 5.4.

²⁵⁶ For an English description: Industrial Efficiency Policy Database, NL-11: [Green Deal](#). Accessed on 14-10-2015.

²⁵⁷ NSOB (2014). [An evaluation of the Interdepartmental Programme BioBased Economy](#).

²⁵⁸ Examples taken from RVO.nl: <http://www.rvo.nl/subsidies-regelingen/projecten-valorisatieprogramma>.

The newly set up organisation StartupDelta will foster the strengthening of the startup ecosystem in the Netherlands.²⁵⁹

5.3 Entrepreneurship skills and STEM policy

As part of the Enterprise Policy, every Top Sector created a human capital agenda (HCA) with the goal of improving the qualitative and quantitative connection between education and businesses as well as increasing the sector's attractiveness to workers by improving career prospects. Particularly relevant initiatives are the Centres of Expertise (higher vocational education) and Centres for Innovative Craftsmanship (intermediate vocational education). Each centre has the mission to "create value for education, research and companies: more and better students, valuable applied research and demand-oriented education."²⁶⁰ Over 60 partnerships are operational throughout the Netherlands. Additionally, the Top Sectors work together in order to address the shortages of STEM graduates. In the *'Master Plan Science and Technology'*²⁶¹ activities of the different HCA's are coordinated when cooperation between sectors is valuable. The common goal is to ensure that in 2025, 40% of graduates completes a beta/technical education.

In May 2013, a variety of public authorities, employers, employees, educational institutions, students and top sectors signed an agreement uniting ambitions with respect to educating more engineers: the *'National Technology Pact 2020'*.²⁶² This pact is in line with the Master Plan Science and Technology and includes three action lines: persuading students to choose for technological education, increasing the number of technologically educated students who actually work (and continue learning) in an engineering profession, and finally: ensuring that engineers who might lose their job maintain active in the technology sector. Most initiatives are governed by the National Platform Science & Technology. In the National Technology Pact Progress Report of May 2015, it is stated that regional collaboration remains all the more important. Regional businesses, education and government work together on the Technology Pact targets. Although a cautious upward trend in attention for technology is observable, there still are too few STEM teachers and too few girls who choose a technical direction. Moreover, in certain technical occupations a shortage is still expected.

With respect to entrepreneurship, the ministers of Economic Affairs, of Education, Culture and Science, and the then minister of Agriculture, Nature and Food Quality (now part of Economic Affairs) have been promoting entrepreneurship in education since the year 2000. This was done together with (umbrella) organisations in the field of education and the business community. With the Action Programme Education and Entrepreneurship the development of entrepreneurial skills, attitudes and entrepreneurship in educations is encouraged. 21st Century Skills are becoming increasingly important and should be linked to education. Universities and industry collaborate in the aforementioned Centres of Entrepreneurship. In addition, the Netherlands Enterprise Agency offers various grants to support SMEs.²⁶³ Grants are, among other things, aimed at research (e.g. vouchers) and training (e.g. Netherlands Management Training Programme).

²⁵⁹ <http://topsectoren.nl/nieuws/topsectoren/startupdelta-maakt-van-nederland-grootste-start-up-ecosysteem/2015-05-15>

²⁶⁰ [Human Capital for Top Sectors](#) (2015). In Dutch.

²⁶¹ [Masterplan Bèta en Technologie](#) (2012). Executive summary in English.

²⁶² For an English summary, see: Techniekpact (March 2014). [Summary Dutch Technology Pact](#).

²⁶³ See <http://www.rvo.nl/subsidies-regelingen>. In Dutch. or <http://english.rvo.nl/>. Accessed on 14-10-15.

5.4 Access to finance

Dutch firms seeking funding, especially when used for innovation, can rely on a diverse spectrum of policy instruments:

The *Future Fund* (previously *SME+ Innovation Fund*) offers revolving funds for a period of four years in order to increase the availability of venture capital for entrepreneurs. The aim of the Future Fund is on the one hand to stimulate fundamental and applied research, while on the other hand finance innovative and fast-growing SMEs. The SME+ Innovation Fund currently includes several financial instruments for innovation and funding fast growing innovation companies. It consists of three main pillars:

Innovation Credit. The Innovation Credit supports development projects with high risks. Companies using the Innovation Credit pay back the loan if their project is successful, otherwise the loan can be converted to a grant. In 2013 the threshold for the Innovation Credit has been lowered to improve access to the scheme for small companies. Moreover, as from 2013 and until (at maximum) the end of 2014, the credit percentage of 35% (the rest of the project costs need to be financed by private parties) was raised to 50%. As of 2015, the maximum percentage is 45%, and the maximum credit was increased to €10 million.²⁶⁴

SEED Capital. This scheme focuses on high technology or creative entrepreneurs. It provides public venture capital investment funds. The scheme improves the return-to-risk ratio for investors. In 2014, €24,4 million was provided with the SEED capital scheme, the highest amount in its existence.²⁶⁵

Dutch Venture Initiative (DVI). In 2013, this financial instrument with a budget of €150mIn was launched in collaboration with the European Investment Fund (contributing one third of the funding). This most recent pillar with 'later stage venture capital' funds focuses explicitly on high-growth innovative enterprises. In 2014, the Dutch government decided on an additional injection of 100mIn euro via the *Action Plan SME funding*, for the purpose of stimulating early phase investments by business angels and private equity parties.

SME loan guarantee scheme (Borgstelling MKB, BMKB). By stimulating banks to provide loans, this scheme allows SMEs to borrow more than would be possible with their own collateral. Until the end of 2014, the BMKB was broadened by increasing the guaranty from 45% to 67.5%, with a maximum of €200,000 per firm.

Dutch Investment Institution (Nederlandse Investeringsinstelling NII). In September 2013, the Minister of Economic Affairs [presented](#) his plans to improve the availability of funding for enterprises. Based on an analysis captured in the [report](#) 'Corporate funding', the minister decided to create a Dutch Investment Agency in cooperation with pension funds, insurers and banks. "By combining knowledge and expertise, and promoting standardization and economies of scale, it will act as an intermediary that matches supply of long-term finance with demand. The aim is to widen financing opportunities for profitable investments and encourage developments that market failure would otherwise prevent. The NII concentrates on social challenges in the Netherlands in such areas as health care, energy, infrastructure, school buildings, housing and sustainability, and regional initiatives. Following consultation, a project planner was appointed to set up an institution that "can stand on its own feet in a couple of years."²⁶⁶ In summer 2015 this led to the creation of the Dutch Investment Agency (Nederlands Investerings Agentschap NIA), as noted in section 3.5.1.

²⁶⁴ Ibid.

²⁶⁵ Ministry of EA (2015). Enterprise [Policy: update on the use of financial measures](#).

²⁶⁶ Ministry of Economic Affairs (September 2014). Budget Memorandum 2014, p. 4.

Microfinancing. Since 2009 the Ministry of EA has been supporting the availability of microfinancing, as executed by the non-profit Qredits Microfinance Institution. In the *Additional Action plan SME funding*, EA announced that Qredit now offers credit of up to €250,000, instead €150,000 as was previously the case. Other microfinance-related initiatives due to the Action plan include 400mln euro made available for financing alternative funding initiatives, 100mln for the Dutch Venture Initiative, as well as 25mln for early phase financing and 5mln for early stage capital funds. Finally, Qredits has expanded its services to coaching, mentoring and helping with credit requests previously denied by banks.

Growth facility scheme (Regeling Groeifaciliteit). This concerns another instrument for helping SMEs to access venture capital. Under the scheme, financiers who provide venture capital to SMEs receive a guarantee: if the bank or venture capital company incurs a loss on the investment, 50% can be reclaimed from the Ministry of Economic Affairs. The guarantee applies to, for instance, losses incurred on the sale of shares, the writing off of a loan, or bankruptcy. The term of the guarantee is a maximum of 12 years. No substantial recent changes apply to this instrument; in a 2012 evaluation, the Growth facility scheme was evaluated predominantly positively.²⁶⁷

Subordinate Debt Fund (AGL fonds). In the *Additional Action plan SME funding*, the minister of EA stated his intention to support other parties in the development of a subordinate debt fund, as advised by the NII. The rationale behind such a fund is that it would help SMEs in attracting loan capital. The Subordinate Debt Fund is currently being investigated by Economic Affairs, in cooperation with the NII.

In addition to the instruments aimed at facilitating private R&D by predominantly SMEs, there is one instrument that focuses on large and medium-sized companies in the Netherlands. The *Business loan guarantee scheme (Garantie Ondernemingsfinanciering, GO)* allows them to borrow substantial amounts of money. Capital providers, since 2013 also including non-banking organizations, receive a 50% guarantee from the government. The term of the guarantee is a maximum of 8 years. The amount involved used to be between €1.5mln and €50mln, but has recently been increased to €150mln.

5.5 R&D related FDI

An important source of international funding for R&D is FDI devoted to such purposes. Embassies with their innovation departments and the Netherlands Foreign Investment Agency (NFIA) have most of the responsibility in this respect. Over the past years their efforts became aligned with the Enterprise policy, in order to ensure a strong and coherent marketing approach for the Netherlands as an export and innovation intensive economy. Apart from focusing on Top Sector domains, this implies that 'Holland branding' is done by a public-private network in which also sector organizations and VNO-NCW have a role. Their joint efforts appear to be successful. The 1% of Dutch companies that is foreign owned together account for 15% of national employment. In 2014, the NFIA helped to attract foreign investments of €3.2bln, as well as 6300 jobs. While the amount of attracted jobs was considerably higher in 2013 (8400), foreign investments are at an all-time high.²⁶ NFIA focuses its activities specifically (but not exclusively) on Top Sectors, which were selected based on their international reputation in the first place. Given the relatively high R&D intensity in the top sectors, a substantial share of FDI concerns R&D expenditures (see section 3.3.2 for detailed figures of R&D with foreign funding sources).

²⁶⁷ Carnegie Consult (2012). [Policy Evaluation Growth Facility Scheme](#) (in. In Dutch).

The NFIA is currently running the project 'The Netherlands: Digital Gateway to Europe'. Its target of attracting 20 ICT-firms in the period 2013-2016 has almost been completed as 19 of them were counted in July 2015. A notable development is the launch of a strategic acquisition strategy for 2015-2020, named 'Invest in Holland', which is again focused on Top Sector domains like Chemicals, HTSM, Life Sciences & Health, and ICT.

Apart from specifically targeting innovation-relevant companies, domains and countries (like the NFIA does), R&D related FDI is also being attracted by policies ensuring the attractiveness of the Netherlands for foreign businesses. As noted in section 2.2, the creation and initiatives of StartUpDelta help innovative firms to establish themselves in the Netherlands. Also, the national government, provincial authorities and several Dutch companies recently formed a working group for improving the business climate for incoming firms. Part of their activities is simplifying rules for foreigners and smoothing interaction with the tax authorities. Of course, here it should be noted that for innovative firms, also the Innovationbox is of major importance when deciding where to relocate. While the activities to attract small enterprises typically involve green field FDI investments, the Innovationbox is one of the arrangements that might convince established foreign firms to take over a Dutch enterprise (brown field investments).²⁶⁸ Nevertheless, there are indications that the Netherlands have had an increasing net outflow of R&D in recent years.²⁶⁹

5.6 Knowledge markets

IPR are seen as important to the Dutch economy and to the overall innovation performance of the Netherlands. One of the key indicators used in the annual Budget of the Ministry of Economic Affairs are IPR related. More specifically the Dutch performance on both patent applications (filed PCT patents) and trademarks applied for at the Office for Harmonisation in the Internal Market (OHIM) are carefully monitored. Over the period 2010-2012 the Dutch position on the first was quite stable (5th among EU-27 in 2012) and on the second slipping somewhat (9th position among EU-27 in 2012).

The main Dutch system for the protection of IPR is the Patent Act ("Rijksoctrooiwet" in Dutch). In essence, the Patent Act is similar to the European Patent Convention, as it provides innovators of a new technology, design, etc, with a temporal monopoly on their invention. At the same time, it functions as a way for inventors to decrease information asymmetry between the patent holder and venture capitalists. The Patent Act protects intellectual property for a maximum of 20 years. In a 2012 evaluation²⁷⁰, it was deemed to have clear added value on the European Patent Convention, due to it being a system with substantial freedom of choice and a good mix between speed, costs and legal certainty. The conclusion also noted that the Netherlands contribute effectively to international IP platforms, and that the executing agency is successful in creating awareness about the possibilities of protecting IPR. The Netherlands Enterprise Agency (RVO) supports entrepreneurs with all (practical) aspects of patent applications and IPR in general.

In the past years, the Dutch government has created several policy instruments to stimulate the development of knowledge markets for patents and licensing. One main instrument is the abovementioned Innovationbox (until 2010: Patent box); a fiscal system which allows profit from patents and R&D to benefit from a lower effective tax rate of 5%. Just like the other fiscal support measures for innovation (WBSO, RDA), to which the Innovationbox is an extension, the scheme is financed by the Ministry of Finance.

²⁶⁸ Dialogic (November 2015). [Evaluation Innovationbox 2010-2012](#). In Dutch.

²⁶⁹ Rathenau Institute (October 2015). [R&D goes global](#).

²⁷⁰ Ecorys (2012) – [Evaluation of intellectual property policy](#). In Dutch.

A difference is that there is no predetermined budget for the Innovationbox, meaning it cannot be exhausted. Current debates about (possibly state-supported) tax evasion led to questions about the effectiveness of the Innovationbox, as it might be used by multinationals that are actually performing their activities (including R&D) elsewhere²⁷¹ (see also the evaluation discussed in section 3.5.2).

According to a recent study, commissioned by the Ministry of ECS, a large share of university patents ultimately find their way to commercial applications.²⁷² Using data from research by, amongst others, the [Netherlands Patent Office](#), the KNAW shows that two thirds of Dutch university patents are sold or licensed to commercial enterprises. According to the Dutch law, ownership of results of scientific research lies with the knowledge institutions and not with the researchers (Rijksoctrooiwet 1995, article 12 & 7). This only applies, however, when work is the result of a carefully framed project commissioned by the employer. In many situations in scientific research this is not the case, so copyright belongs to the researcher. In the Collective Labour Agreement of Dutch universities detailed provisions are included on the obligation of employees to report findings and to provide the employer cooperation to enable them to apply for a patent or other application. Almost all institutions also have internal regulations that stipulate how to deal with intellectual property.

5.7 Knowledge transfer and open innovation

5.7.1 Indicators Funding

Funding: BES-funded/publicly-performed R&D

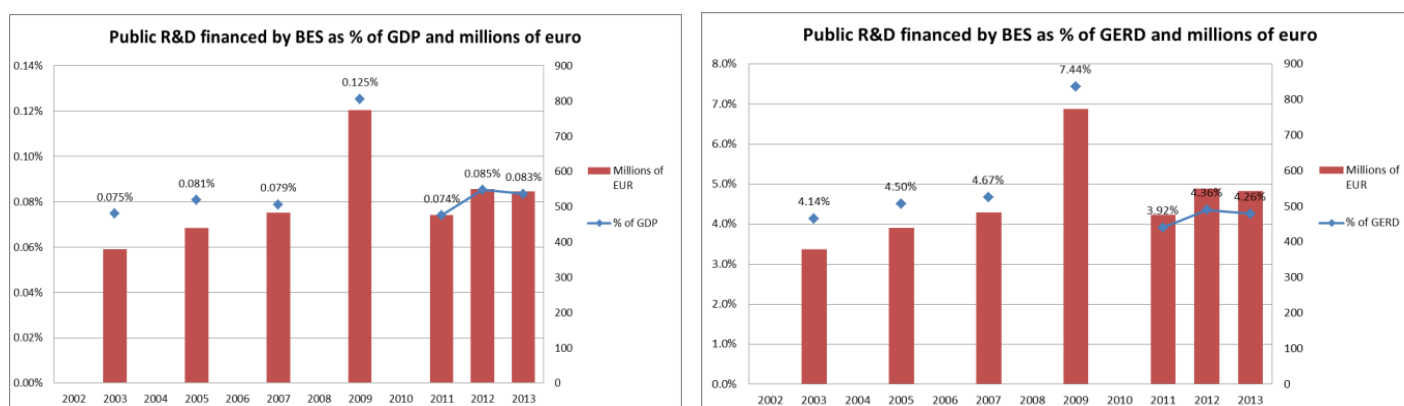


Figure 17: BES-funded public R&D in The Netherlands as % of GERD (in €MLN) and % of GDP

The level of the Dutch business enterprise (BES)-funded public R&D expenditure as a percentage of GERD remained roughly similar over the past decade at around 4%, except for a sharp increase in 2009 to 7.44 % (data on 2008 and 2010 are not available). In absolute terms there has been an increase between 2003 and 2013, again with a peak in 2009. Similar observations can be made when expressing the indicator as % of GDP. The GERD intensity (GERD as % of GDP) saw a drop in the period 2008-2010. After 2011 it returned to higher levels and increased to around 2 % of GDP.

²⁷¹ Minister of Finance (November 2014). [Response to questions about the Innovationbox](#). In Dutch.

²⁷² KNAW (2014). [Benutting van octrooien op resultaten van wetenschappelijk onderzoek](#). In Dutch.

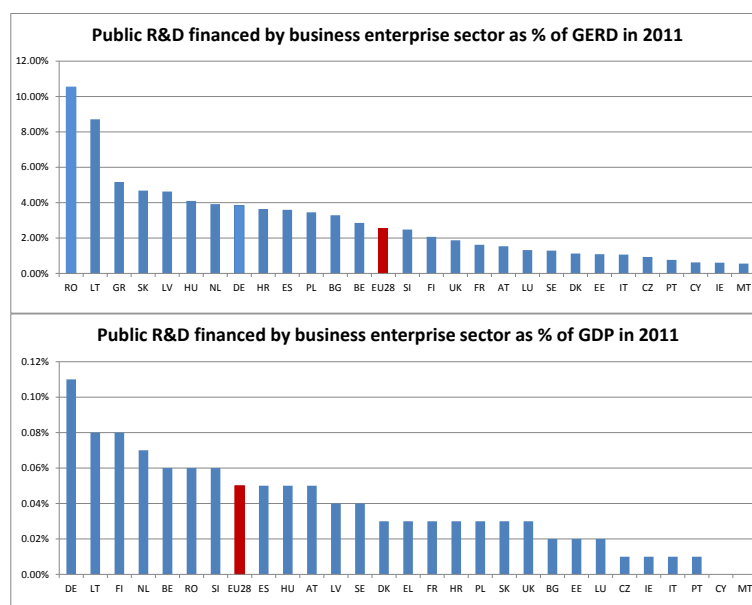


Figure 18: BES-funded public R&D as % of GERD and as % of GDP in 2011 in Member States²⁷³

The two charts in Figure 18 show the values of BES-funded public R&D in all EU-28 as percentages of GERD and GDP respectively.

The Dutch levels are well above the EU average and belong to the top 10 and top 5 performers for the respective indicators.

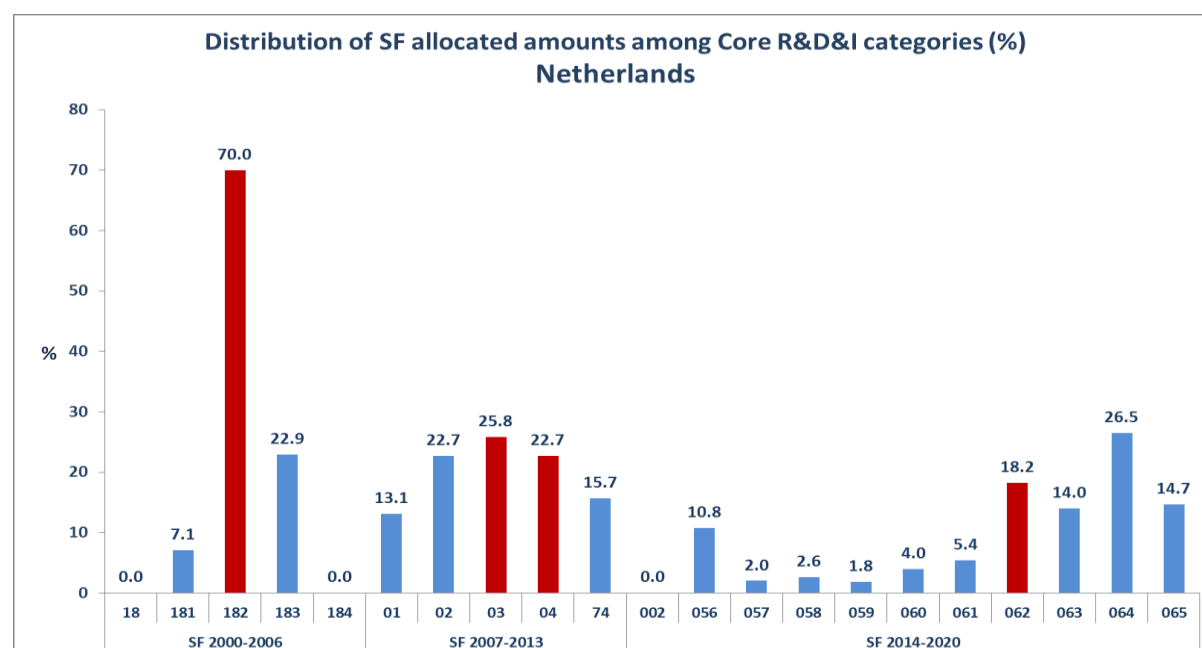


Figure 19: Structural Funds for core R&D activities 2000-2006, 2007-2013 and 2014-2020²⁷⁴. We use the categories: 182 (2000-2006), 03 and 04 (2007-2013) and 062 (2014-2020) as proxies for KT activities.

²⁷³ 2011 was chosen as the latest data series providing a full comparison within EU-28.

²⁷⁴ Figure 18 provides the Structural Funds allocated by the Netherlands for each of the above R&D categories. The red bars show the categories used as proxies for KT. Please note that the figures refer to EU funds and they do not include the part co-funded by the Member State. Source: JRC elaboration on data from DG REGIO. The categories for 2000-2006 include: 18. Research, technological development and innovation (RTDI); 181. Research projects based in universities and research institutes; 182.

The Netherlands has allocated 18.2% of its structural funds for core R&D activities to "Technology transfer and university-enterprise cooperation primarily benefiting SMEs" (compared to 70% for 2000-2006 and 48.5% in the 2007-2013 programming period). This is more than the EU average of 15.7%, but the difference was much larger in the previous two programming periods since the EU average was 26.1% for 2000-2006 and 30.1% for 2007-2013).

Overall, the contribution of structural funds in EC funding to the Netherlands is small relative to FP / Horizon 2020 funding. The entrepreneurial discovery process underpinning the development of smart specialisation strategies at the regional level has brought different stakeholders together. The regions are also considered to provide a substantial contribution to investments in the top sectors. The selected top sectors show a strong overlap with the selection areas for regional smart specialisation (though not all regions have selected all top sectors for their specialisation strategy).

Innovation and technology transfers, establishment of networks and partnerships between business and/or research institutes; 183. RTDI infrastructures; 184. Training for researchers.

The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.

The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.

The categories for 2014-2020 include: 002. Research and Innovation processes in large enterprises; 056. Investment in infrastructure, capacities and equipment in SMEs directly linked to Research and Innovation activities; 057. Investment in infrastructure, capacities and equipment in large companies directly linked to Research and Innovation activities; 058. Research and Innovation infrastructure (public); 059. Research and Innovation infrastructure (private, including science parks); 060. Research and Innovation activities in public research centres and centres of competence including networking; 061. Research and Innovation activities in private research centres including networking; 062. Technology transfer and university-enterprise cooperation primarily benefiting SMEs; 063. Cluster support and business networks primarily benefiting SMEs; 064. Research and Innovation processes in SMEs (including voucher schemes, process, design, service and social innovation); 065. Research and Innovation infrastructure, processes, technology transfer and cooperation of enterprises focusing on the low carbon economy and on resilience to climate change.

Cooperation: Share of innovative companies cooperating with academia

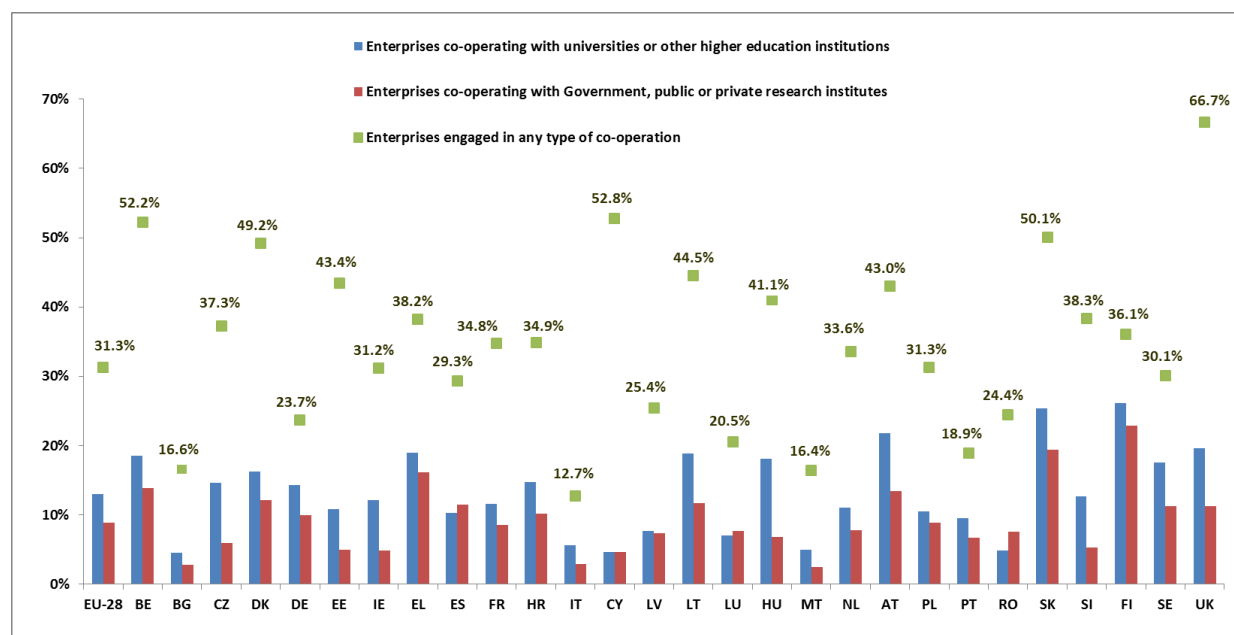


Figure 20: CIS survey 2012 – share of enterprises cooperating with academia

Figure 20 depicts the level of cooperation activities of innovative companies in the EU-28, according to the CIS 2012. The percentage of "enterprises engaged in any type of co-operation" (green dot) in the Netherlands is 33.6% slightly above the EU average of 31.3%. The percentage of enterprises involved in cooperation with universities or other HEIs (blue bar) is 11.0%, whereas government, public or private research institutes (red bar) is 7.8%. Both indicators are slightly below the values of the EU-28 average, which are 13.0% and 8.9% respectively. More importantly, the Netherlands scores considerably below peer countries such as BE, the UK, DK, SE and DE on this indicator. How can this be squared with the relatively high rates of privately funded / publicly performed R&D shown in figure 20 One explanation is that large multinationals fund a great deal of publicly performed R&D, whereas the absolute number and relative share of innovative firms collaborating with public research organisations remained low (note that the figures do not yet take into account the dynamics caused by the Topsector policy). Looking at the rates of collaboration of peer countries and innovation leaders one can see further space for intensifying cooperation between innovative Dutch enterprises and academia. Figures like the ones above stress the importance of policies truly open to wide participation in public-private research collaboration. This is what the Topsector approach and especially the TKIs intend to achieve. An evaluation of the Topsector approach and the PPP-research conducted in the TKIs is foreseen for 2016.

Cooperation: Technology Transfer Offices (TTOs), incubators and technological parks

Since 2005 knowledge valorisation has become a third mission (in addition to research and higher education) of Dutch universities.²⁷⁵ All Dutch universities, academic medical centres and a large number of its research institutes have technology transfer offices or a comparable unit. The mandate, the size and the means of the university TTO varies considerably between the universities and academic medical centres."²⁷⁶

Since 2004 the TTOs have received additional means and that the number of TTO personnel has increased. The TTO staff / university faculty ratio varies between 1 : 100 to 1: 1000.²⁷⁷;

TTOs generally manage to cover their own costs but not much more. There are cases in which income is substantial. In general, however, it is companies that bear the risks and reap the gains. For universities, TTOs offer a way to engage with business which can be interesting for other reasons than direct income generation through the exploitation of patents.²⁷⁸

A number of business incubators were set up in the 1990s, in the wake of government policies. At present there are over 60 Business incubators in the Netherlands (See annex 1 for an indicative list)²⁷⁹. Most major Dutch universities have associated incubators.

There are also a number of Science parks in the Netherlands close to the major Dutch universities. A non-exhaustive list includes: Science Park Amsterdam (Amsterdam); Utrecht Science Park (Utrecht); Bio Science Park Leiden (Leiden); Technopolis Delft (Delft); HighTech Campus Eindhoven (Eindhoven); Science Park Maastricht (Maastricht); Business and Science Park Wageningen (Wageningen); etc.

Per university, an average of 6.7 companies is established annually on the basis of knowledge and technology generated in the university. For each 1000 scientific researchers an average of 1.86 spin off companies is established.²⁸⁰ The Knowledge transfer study²⁸¹ indicates a somewhat higher number.

The science parks and incubators from universities and high tech companies form important elements of the various knowledge clusters in the Netherlands, including Brainport Eindhoven, Wageningen Food Valley, Health Valley, etc.

²⁷⁵ One could argue that it already was since the introduction of the higher education and science act (as this included "societal service") even though the concept of valorisation is newer.

²⁷⁶ van Dongen, P., Winnink, J., Oomen, P., Seip, M., 2013 Regionale Innovatie Systemen (RIS) en IP- based entrepreneurschap in de economische regio's rondom Nederlandse universiteiten, Agentschap NL, Divisie NL Octrooiencentrum; van Dongen, P., Winnink, J., Tijssen, R., Academic inventions and patents in the Netherlands: A case study on business sector exploitation, World Patent Information, Volume 38, September 2014, Pages 27–32

²⁷⁷ Idem

²⁷⁸ <http://www.knaw.nl/nl/actueel/nieuws/universitaire-octrooien-goed-benut>

²⁷⁹ <http://dutchincubator.nl/incubator/lijt-business-incubators/>

²⁸⁰ van Dongen, P., Winnink, J., Tijssen, R., [Academic inventions and patents in the Netherlands: A case study on business sector exploitation](#), World Patent Information, Volume 38, September 2014, Pages 27–32

²⁸¹ www.merit.unu.edu/publications/uploads/KTS_2010_2012.pdf

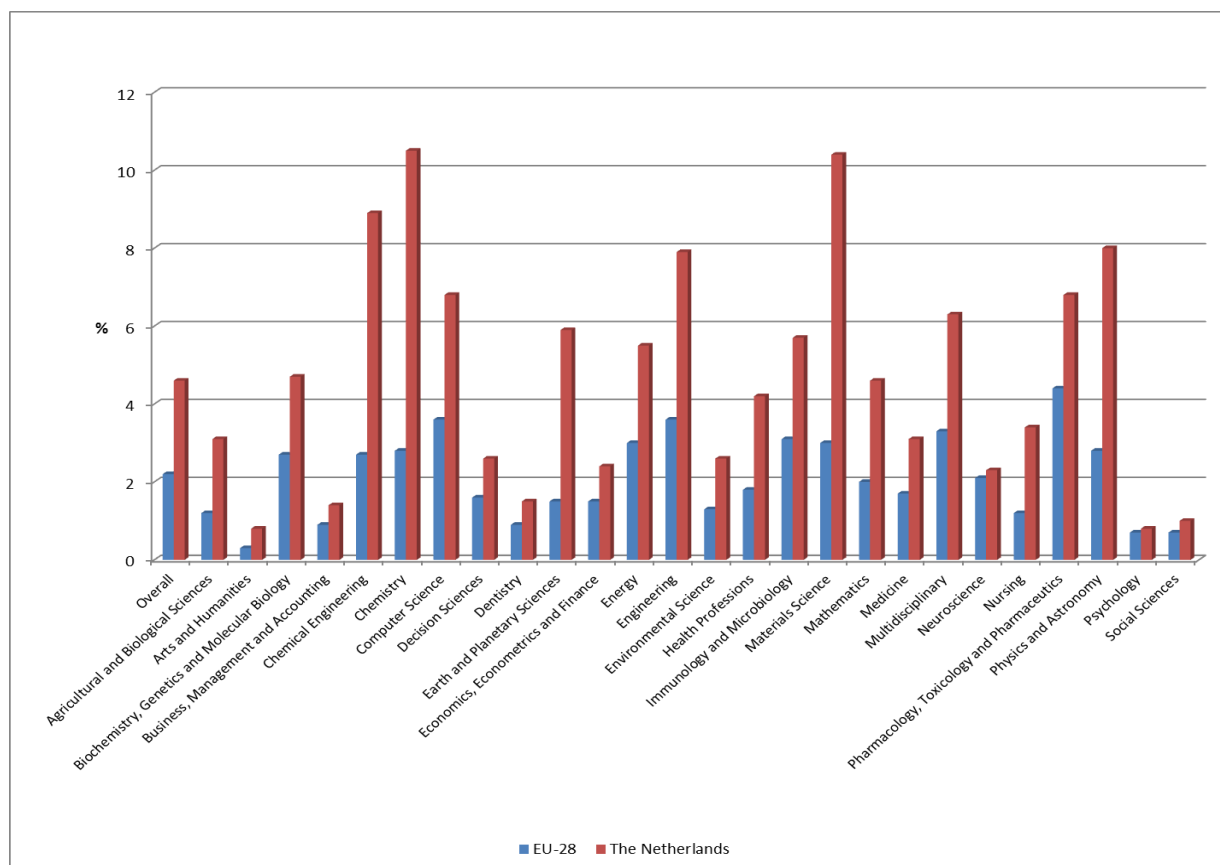


Figure 21: Public-private co-publications by field 2003-2013 in THE NETHERLANDS. Scopus database²⁸²

The Figure 21 shows the 2003-2013 average percentage of academia-industry co-publications by field in the Netherlands compared to the European average. The total share of co-publications, displayed by the red "overall" bar on the left of the chart, is 4.6%, more than double the EU-28 average of 2.2%. Between 2008 and 2013, however, there has been a decline from 5 % to 4% of the total publications. Excluding multidisciplinary publications, the domains recording the highest share of co-publications are pharmacology, immunology, engineering, energy, materials and computer science, chemistry and chemical engineering. The Dutch rate of public-private co-publications lies well above (often twice as much or more) the EU average in all fields.

The rate of public-private co-publications per million population is around 115. This is well above the EU-28 average of 29. It is similar to Sweden, and third behind Denmark (182) and Finland (155).²⁸³

²⁸² Scival © 2016 Elsevier B.V. All rights reserved. Scival® is a registered trademark of Reed Elsevier Properties S.A., used under license

²⁸³ The number of public private co-publications per million population and the ranking may differ from the indicators provided in the IUS. Apart from the use of a different bibliometric database, an explanation for this discrepancy is that in the case of the IUS, domestic enterprises are taken as the unit of analysis whereas Scival considers both universities and companies. As a result the indicator provided here also takes into account copublications between domestic universities and foreign companies.

Patenting activity of public research organisations and universities together with licensing income

Some Dutch universities are, by European standards, very prolific in patenting.²⁸⁴

Recent publications²⁸⁵ highlight the large under-estimation of university research derived patents if one only considers patents applied for by universities. "In the period between 2000 and 2010, the study identified 2898 patent applications based upon scientific research at Dutch universities and related to university inventions. 952 of these university inventions patent applications were filed by the universities themselves. The total number of university based related patent applications represent 5% of the total volume of patent applications of Dutch origin."²⁸⁶

Per university an average of 30 patents is applied for per year, with large differences between universities. This is comparable to other universities in Europe and the USA.²⁸⁷

The APE-INV study of European patent applications, identified 600 academic inventors in the Netherlands who represented 2.75% of academic scientists employed by universities in 2005–2007. This share is relatively low compared to Denmark, France, Italy, Sweden, and the United Kingdom; but double appointments and close ties between Philips, a large electronics company, and Eindhoven University of Technology are mentioned as possible explanations.²⁸⁸

The share of cross-sectoral patent co-applications in the Netherlands was 15.8 % in the period 2002–2011. The share of cross-sectoral co-inventions (normally much higher than the share of co-applications as is also the case for NL) was 66.7%.²⁸⁹

Cooperation: spin off companies

Van Dongen et al (2013) find an average of 6.7 spin-offs were created per university per year, of which 2.7 are IP based.²⁹⁰ The KT study²⁹¹ indicates based on the EKTIS 2011–2012 survey²⁹² that, while below the rate of Sweden, Ireland and Portugal, the Netherlands shows a comparable rate to Switzerland and is with 2.4 well above the European average of 1.7 in terms of the number of start-ups per 1000 research staff.

5.7.2 Policy Measures

Generally, research commercialisation possibilities have been perceived as limited due to a lack of venture capital and business angels. Entrepreneurs generally find the lack of finance the most problematic factor in doing business in the Netherlands, especially in the seed and early-stage phases. The government has initiated a number of grant schemes to foster collaboration between public research organisations and businesses.

²⁸⁴ van Dongen, P., Winnink, J., Tijssen, R., [Academic inventions and patents in the Netherlands: A case study on business sector exploitation](#), *World Patent Information*, Volume 38, September 2014, Pages 27–32

²⁸⁵ Idem and van Dongen, P., Winnink, J., Oomen, P., Seip, M., 2013 *Regionale Innovatie Systemen (RIS) en IP- based entrepreneurschap in de economische regio's rondom Nederlandse universiteiten*, Agentschap NL, Divisie NL Octrooiencentrum;

²⁸⁶ idem

²⁸⁷ <http://www.knaw.nl/nl/actueel/nieuws/universitaire-octrooien-goed-benut>

²⁸⁸ Lissoni, F., [Academic patenting in Europe: an overview of recent research and new perspectives](#), *World Pat Inf*, 34 (2012), pp. 197–205; van Dongen, P., Winnink, J., Tijssen, R., *Academic inventions and patents in the Netherlands: A case study on business sector exploitation*, *World Patent Information*, Volume 38, September 2014, Pages 27–32 For a small scale survey of the exploitation of university patents see

http://www.rvo.nl/sites/default/files/Regionale%20Innovatie%20Systemen%20%28RIS%29%20en%20IP-%20based%20entrepreneurschap%20in%20de%20economische%20regio's_april2013.pdf

²⁸⁹ <https://www.ecoom.be/sites/ecoom.be/files/downloads/indicatorenboek2013.pdf>

²⁹⁰ van Dongen, P., Winnink, J., Oomen, P., Seip, M., 2013 [Regionale Innovatie Systemen \(RIS\) en IP- based entrepreneurschap in de economische regio's rondom Nederlandse universiteiten](#), Agentschap NL, Divisie NL Octrooiencentrum

²⁹¹ www.merit.unu.edu/publications/uploads/KTS_2010_2012.pdf

²⁹² MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012

Some programmes have been designed for specific sectors, such as nanotechnology and life sciences, while others have a more general focus.

In 2010 the Dutch government launched a funding mechanism to promote spinouts. To facilitate innovative entrepreneurs to find funding for innovative projects for which they have difficulty in accessing funds from the domestic and international market, the government established a €500m "Innovation fund for small and medium-sized enterprises-plus (MKB+)". This fund, which was fully implemented in 2015, is managed by the RVO and doubled the previous resources for innovation loans for small and medium-sized enterprises.^{293,294} The 'Pieken in de Delta' program, providing subsidies to the innovative programs of businesses and knowledge institutes in six competitive clusters, has stopped accepting new applications in 2011.

Central to the current Dutch policies and funding instruments for KT and PPP is the top sector policy.²⁹⁵ "Improving exploitation of scientific knowledge by supporting triple helix collaboration [promoting closer cooperation between knowledge institutions, businesses and public authorities in the programming of basic and applied research] is one of the main pillars of the Enterprise Policy. The top sector approach is concentrated on nine priority areas characterized by scientific excellence and high export opportunities: [water, agro-food, horticulture, high-tech, life sciences, chemistry, energy, logistics and creative industries]. Although selection of these priority areas resulted from a top-down process, actual design of sector-specific instruments is based on a bottom-up approach. For each top sector, a '*top team*' of entrepreneurs and researchers has been formed in 2011. These multi-institutional top teams are requested to optimize the scientific and commercial performance of their sector, in which knowledge transfer plays an essential role. Although the innovation voucher scheme is no longer continued, several instruments for knowledge transfer and collaborative efforts are made available to the top sectors.

In an interactive policy process, the government, the business sector and knowledge institutes in the top sectors jointly identified the problems and opportunities for each sector. The top teams presented their first *policy agendas* (2012/2013) in 2011. These so-called *Innovation Contracts*,²⁹⁶ which are updated bi-annually, contain integrated sector-specific roadmaps regarding domains like education policy, research policy, foreign policy, and environment policy. The first Innovation Contract dates from 2nd of October 2013, when it was signed by the top sectors, knowledge institutions and the Dutch cabinet. In the Autumn of 2015 new innovation contracts were signed.²⁹⁷ In this *Innovation Contract 2016/2017*, stakeholders promised an annual research investment of almost €4.2b (out of which about 2.2b by the private sector, and €2b in public investments). In the Innovation Contracts, it is agreed how the available resources will be used in each top sector to build on existing scientific excellence and to meet the need for innovative solutions to societal problems. E.g. for ICT in the top sectors an additional 40 million becomes available from the public sector and for water R&D €46m.

In this vein, alignment with the societal challenges formulated in European research programs and Horizon 2020 is emphasized, amongst others by specifying the broader relevance of each research topic mentioned in the Innovation Contracts. Furthermore, participation in European programs is supported with a total (co-funding) budget of €36m for the years 2014-2017. Another element is the role of regional governments and stakeholders which is considered especially important for the support of SMEs. Regional funding in the top sectors amounts to approximately €100m.

²⁹³ http://ufm.dk/en/publications/2014/danish_council_research_policy_pdfa-1.pdf

²⁹⁴ <http://www.rvo.nl/onderwerpen/innovatief-ondernemen/innovatiefinanciering/innovatiefonds-mkb>

²⁹⁵ See also: <http://www.rijksoverheid.nl/onderwerpen/ondernemersklimaat-en-innovatie/investeren-in-topsectoren>

²⁹⁶ <https://www.rijksoverheid.nl/documenten/convenanten/2012/04/02/nederlands-kennis-en-innovatie-contract>

²⁹⁷ <https://www.rijksoverheid.nl/documenten/rapporten/2015/10/05/nederlands-kennis-en-innovatiecontract-2016-2017>

E.g. <http://www.tki-energo.nl/wie-zijn-wij/innovatie-contract/>; <http://www.clicknl.nl/innovatie-contract/>

In this light it is relevant to mention that the Regional Smart Specialisation strategies, which are an ex ante conditionality for receiving structural funds, are well aligned with the top sectors identified at the national level.

Public Private collaboration is a central element also of these strategies. In 2014 public and private actors have jointly invested €81m in 3500 innovation projects. €359m came from private sources. The government's target that by 2015, €50m would be invested in public private collaboration of which at least 40% would be financed by the private sector was achieved.

In the course of 2012, the parties collaborating in the top sectors established 19 *Top Consortia for Knowledge and Innovation (TKIs)*²⁹⁸, which have started to implement the research agendas that are part of the Innovation Contracts (12 TKIs from 2016 onwards). Enterprises can participate in incidental or multi-annual research projects by investing resources. For each euro an enterprise contributes to a TKI, the government adds another 25%. This TKI-allowance, which is intended to spur private financing for TKI projects, had a total budget of €83- m in 2013, which was increased in 2014 and 2015 to 200m²⁹⁹ Note that firms do not receive subsidy for their own research activities, but contribute to the joint research being performed in the TKIs themselves. The research within this TKIs is funded both through the TKI-allowance (inviting firms to contribute to applied research) as well as through other measures (e.g. the NWO grants aimed at fundamental research³⁰⁰).

There is a difference between the sum of funds the TKIs collect using all the measures described in the previous section (for 2013: €200m private plus €371m public) and the amount of money they are actually spending on performing research projects. In 2014 industry invested 359m in research conducted in TKIs, which amounts to 44% of total funding for TKI-projects.³⁰¹ Taken together with the public funding, the total TKI R&D-expenditures were €814m. This is above the target of €800m, out of which 40% funded by private parties. The new top sectors approach based on public-private partnerships can play a role in improving the valorisation of public knowledge by bringing about closer cooperation between business and public research performers, while raising the scope and ambition of business innovation including in performing more R&D (OECD, 2014).

Given the ambition to connect to European research programmes, as expressed in the Innovation Contract 2014/2015, part of the available funds is available to co-finance EU projects. In order to enhance the participation of SMEs in TKIs, firms can enjoy a special TKI-allowance of 40% for the first 20,000 euro they contribute. From 2014 onwards, SMEs also have the possibility to contribute this first 20,000 euro in kind rather than [in] pecuniary [terms]. Moreover, each TKI has a contact point devoted to SMEs. These contact points help small and medium [sized] enterprises with identifying appropriate research programs and innovation activities.

By relying on acquired experiences, both within the TKIs as well as in earlier platforms for public-private partnerships³⁰², it is planned for 2015 to make the criteria for TKI-allowance more demand driven and flexible with respect to how to use the investments.

²⁹⁸ See also: <http://www.rijksoverheid.nl/onderwerpen/ondernemersklimaat-en-innovatie/investeren-in-topsectoren>

²⁹⁹ For the TKIs related to the topic of energy, like the TKI for 'Biobased Economy', additional funding was available from innovation resources specifically related to energy (e.g. the measure 'SDE+'). <http://topsectoren.nl/innovatie>

³⁰⁰ The N.W.O. does not only fund fundamental research in the TKI. For example the KIEM (knowledge – innovation mapping) is a new instrument for SMEs in the chemical sector to realise an innovation. KIEM aims to foster collaboration for an SME with one or several public research organisations / HEI and for initiatives of start ups in the chemical sector. For each euro input from the SME, NOW adds four. The total size of the project is fixed at 18.750 euro.

³⁰¹ Ministry of Economic Affairs (October 2015). [Progress Report Enterprise Policy 2015](#). In Dutch.

³⁰² The most notable example of such platforms are the Technological Top Institutes (TTI).

In 2014, a total of 1900 firms participated in the TKI's collaborative research projects, out of which 1400 SMEs. Within the MIT (MKB-innovatiestimulerend Topsectoren), a menu of partial subsidy instruments is available, ranging from collaborative business-to-business R&D projects, feasibility studies, knowledge vouchers, hiring highly qualified staff, networking activities and innovation brokers. The top sectors themselves advise the Ministry of EA which instruments are best suited to the needs of SME's in their sector and thus how to divide the available budgets. Thanks to the MIT-measure, 700 SMEs actually provided financial contributions. Their private funding of €60mln was complemented with the Ministry of Economic Affairs' MIT-budget of €30mln.^{303 304} In the 2015 budget the increase in the MIT budget was made structural.

To improve the connection between education and labour market (especially within the Top Sectors) several [Centres of Expertise](#) (higher education) and [Centres for innovative craftsmanship](#) (vocational education) were established. In these centres students, teachers and businesses work together. At the moment there are 24 Centres of expertise and 17 centres for innovative craftsmanship (October 2015).²⁶ To a large extent, these centres are located at one of the campuses in the Netherlands.

The RAAK Programme, executed by NWO's SIA, is a competitive funding scheme for research in applied universities. It consists of four programs: for the promotion of collaboration between polytechnics and SMEs, for collaboration between polytechnics and regional public bodies; RAAK PRO for collaboration between polytechnics research organisations and companies; and RAAK international for collaboration between Polytechnics, their regional network and foreign organisations. Recently, budget cuts to this programme were prevented, and in 2014 the budget (now being allocated through NWO) actually increased with €13mln up to almost €30mln. This is partially due to an additional investment in practice-oriented research, amounting to €3mln in 2014 and €7mln in 2015.

Technology Foundation STW runs several programmes focused at knowledge transfer between the technical sciences and users of research results. The Foundation funds top scientific and technical (collaborative) research through a range of grants. On average, STW runs about 600 projects simultaneously. These projects result annually in 85 PhD theses, 600 publications and 10 patents.³⁰⁵ As noted in section 5.2 STW's Valorization Grant ('Take off' as of 2014) is designed to take start ups like university spin-offs through different growth phases. The €19 m of subsidies that was awarded to projects in the period 2004-2011 led to 47 successful start-ups, together having an annual turnover of €16,8m. Apart from receiving funding from NWO and the Ministry of EZ (annually: €55m), STW budgets also originate from co-funding by partners in research projects (€10m) and in-kind contributions (€14m)."³⁰⁶ The total budget of STW in 2013 was €101m – which has decreased somewhat in 2014 and 2015 as it was decided to reduce its requirements for co-financing from 35 to 30%. Apart from the programme 'Take off' the STW implements "perspectives for the top sectors" for programmes involving consortia of knowledge institutes and companies. In November 2015 five new research programmes were funded within this program receiving €16m from STW matched with €8m from MNCs, SMEs and start ups. "Partnership" is another programme for projects with a single specific partner on the user's side, usually a company and the "Open Technology Programme": open competition for individual projects.³⁰⁷

³⁰³ For an overview of funding available for public private partnerships, also see the "Annex: Middelen voor publiek private samenwerking in de topsectoren" in the monitor enterprise policy: <http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2014/10/10/monitor-bedrijvenbeleid-2014.html>

³⁰⁴ <http://www.rvo.nl/subsidies-regelingen/topsectoren-mit>

³⁰⁵ www.stw.nl/en

³⁰⁶ See: <http://www.stw.nl/en/content/organization>. Accessed on 14-10-2015.

³⁰⁷ See also : http://www.stw.nl/sites/stw.nl/files/jaarverslagen/Jaarverslag%202013_0.pdf ; <http://www.stw.nl/content/stw-investeert-record-technische-wetenschap>

Another measure contributing to the creation of university spin-offs is the Business Angel Program, as it brings researchers in contact with entrepreneurship expertise and funding opportunities.

Section 5.2 also mentions the Technostarter programme called '*Subsidy scheme Knowledge Exploitation*' (SKE), which led to the creation of innovation incubators at universities and science parks. Following up on the SKE, the Ministry of EA launched her Valorisation Program in 2010.³⁰⁸ This program supports 12 consortia (knowledge and research institutes, enterprises, NGO's, government) in the development of entrepreneurship education and knowledge valorisation. Start-ups can approach these consortia for advice and funding, including pre-seed and proof-of-concept loans. The program runs until 2018 and has a budget of €63mln.

In the context of the new 2013 Quality in Diversity in Higher Education Act, the government has reached performance agreements with universities and universities of applied science – the performance of the HEIs is tied to a variable part of institutional funding. In the performance agreements as agreed in autumn 2012, valorization appears as one of the priorities.³⁰⁹ As part of the new R&I policy, the government is reorganizing its applied research institutes to reduce governance costs and reduce complexity for SMEs.

When it comes to incentives for researchers to share their knowledge, there is increasingly support for including social impact in the evaluation criteria of scientific personnel. The Standard Evaluation Protocol (SEP), which describes the methods used by the VSNU, NWO and KNAW to periodically evaluate research conducted at Dutch universities and NWO and Academy institutes, does not use to contain assessment criteria on knowledge transfer. However, NWO promotes knowledge transfer by individual academics by including it as a selection criterion for funding proposals.³¹⁰ Every proposal is (partly) evaluated based on the potential contribution to society and other scientific disciplines, as well as the specific expected gain for external parties who might benefit from the knowledge that would be created. Moreover, researchers are asked to come up with a concrete action plan to ensure knowledge transfer indeed takes place. As such, academics have an incentive to come up with proposals that score highly on the (potential) transfer of knowledge. A joint project on this topic, called Evaluating Research in Context (ERiC), was performed by the Royal Netherlands Academy of Arts and Sciences (KNAW), the Association of Universities in the Netherlands (VSNU), the Netherlands Organization for Scientific Research (NWO) and the Netherlands Association of Universities of Applied Sciences (HBO-raad), and the Rathenau Institute.³¹¹ ERiC developed a methodology to assess the societal relevance of academic relevance, which should make it possible to reward researchers for engaging in knowledge transfer. The importance of achieving social impact is addressed explicitly in the Science Vision 2025.

The same holds for intersectoral mobility. As noted in section 4.4.2, there are plans to create more opportunities for industrial doctorates. Similarly, the Science Vision 2025 stresses the importance of aligning PhD trajectories with demands from the industrial labor market. Plans³¹² for the reorganisations of the Dutch Research Council NWO foresee a more centralised governance as well as stronger interaction with societal stakeholders including the private sector. In 2015, the FOM (supporting fundamental research) published an external evaluation of its Industrial Partnership program.³¹³

³⁰⁸ RVO.nl. Valorisatieprogramma. Accessed on 03-04-2016. In Dutch.

³⁰⁹ http://wetten.overheid.nl/BWBR0033693/geldigheidsdatum_09-12-2014 ; letter minister of education and science to governing boards of universities

³¹⁰ NWO (2014). Call for proposals. Investerings NWO-groot.

³¹¹ EriC (June 2010). Evaluating the societal relevance of academic research: A guide.

³¹² <http://scienceguide.nl/201504/wetenschap-in-balans-bij-nwo.aspx>

³¹³ <http://www.scienceguide.nl/201506/nieuwe-wegen-voor-industrie-en-wetenschap.aspx?rss=1>

5.8 Regulation and innovation

When launching the Enterprise Policy, regulation was predominantly seen as something which needs to be organized in a way that it is not costly to businesses. This is ensured by [Actal](#), the Dutch Advisory Board on Regulatory Burden. The independent board is responsible for testing and reducing hindrance of regulation, and has published several reports on innovation-related topics. In the Coalition Agreement, it was agreed that the administrative burden for enterprises, citizens and professionals will have to be reduced with €2.5 billion. This goal has to be realized through a range of interventions presented in a [policy letter](#) ('*Goed Geregeld*') by the ministers of Economic Affairs as well as Interior and Kingdom Relations. Selected measures include: prevention of unnecessary rules, duplication in data collection, harmonization and standardization of administrative procedures, focused use of ICT and digital services and better communication. A special initiative is the *Proof of Good Service (Bewijs van Goede Dienst, BvGD)*, which is a certificate for helping municipalities to improve their services. Another action is the program '*Better and more concrete: good rules and focused service*', in which local governments commit themselves to reducing administrative burdens. The Dutch government also has been undertaking efforts to make individual policy measures more accessible. An example is the intention to simplify the TKI allowance and MIT-measure, which is supposed to attract more SMEs.

Nowadays, it is increasingly acknowledged that all authorities exert influence on R&I dynamics, not just in laws explicitly devoted to this topic. One of the key missions of the Topsector policy is to identify and address regulatory bottlenecks, which requires tailor made solutions with the involved Ministries. Also, almost 200 Green Deals between government and businesses have been signed since 2011, often including regulatory issues.³¹⁴ Over 2015 the Ministry of EA has repeatedly been stressing the importance of creating innovation-conducive framework conditions by reforming regulation with respect to, for instance, cabs or housing (thereby referring to the governmental ambition of participating in trends like the rise of innovative business models based on the idea of the sharing economy).³¹⁵ The Ministry of Infrastructure and the Environment is supporting experimentation by creating 'regulation-free zones', for instance when it comes to test driverless cars.³¹⁶ In July 2015, the minister of EA (also on behalf of the ministries of Safety and Justice, and Internal Affairs and Kingdom Relations) send a letter to the parliament in which he explained the importance of flexible and adaptive regulation when it comes to creating room for experimentation.³¹⁷ The letter describes how regulation can be made future proof in two ways. In the first place the minister identifies a range of rules that have to be modernised in such a way that innovation and technological developments are encouraged rather than hampered. Secondly, the letters proposes how new regulation can be structurally designed according to an approach that allows for easy adaptation.

5.9 Assessment of the framework conditions for business R&I

All in all, the Dutch policy mix for R&D&I appears to be fairly competitive on the accounts discussed in previous sections. From the reported analyses, there are no clear indications of bottlenecks or dis-balances in the innovation system. A minor issue is the question what share of budgets devoted to entrepreneurship truly spur R&D&I, and what share only helps freelancers to survive in the market.

³¹⁴ RvO.nl (March 2016). [Green Deals in Beeld. Voortgangsrapportage 2011-2015](#). In Dutch.

³¹⁵ Maarten Camps (January 2015) – [Sturen op de toekomst](#). ESB.

³¹⁶ Ministry of Infrastructure and the Environment (Jan. 2015) – [The Netherlands as testing area for driverless cars](#).

³¹⁷ Minister of Economic Affairs (July 2015). [Future proof laws and regulation](#). In Dutch.

Suspensions that the latter share is relatively high give rise to claims that this part of funding could be spent more effectively, as several relatively large tax schemes focus on SMEs without targeting innovation and productivity increases.³¹⁸

Although foreseen for 2015, a large public debate and revision of entrepreneurship policies has not occurred so far. At this point it is hard to state to what extent an entrepreneurial ecosystem goes at the cost of framework conditions for business R&I. One explanation for private research and innovation expenditures not picking up is that firms are still recovering from the crisis and the associated budget cuts by the national government. Past recessions might inhibit investments, but it should be noted that turnover from innovation is keeping up.

Compared to the predecessors of the Enterprise Policy (e.g. the Innovation Programs strategy), the current balance between supply and demand-side policies is rather even. Subsidies for innovation have been cut and centres for technological research are no longer operating on their own: instead, most R&D&I activities occur through structures in which public and private parties collaborate on topics with economic as well as societal (in a broader sense) relevance. The topteam, Top Sectors, TKI's, and Innovation Contracts are but a few examples of developments in which joint formulation is manifested.

³¹⁸ Dialogic (May 2015). [Evaluation Innovation and Entrepreneurship Policy Mix](#) (article 12/13) 2009-2013.

6. Conclusions

6.1 Structural challenges of the national R&I system

Looking at the performance and dynamics within the Dutch research and innovation system, several major challenges can be identified. The challenges below (summarized in **Table 11: Structural challenges and current status of policy solutions**) are the most prominent ones, but in its assessment of the Dutch innovation policy (September 2014) the OECD also mentions weaknesses and threats like lagging productivity in some sectors, the frequent number of changes in innovation policy, limited public recognition of the benefits of science, technology; and entrepreneurship, and failures regarding the use of human capital and abilities to diversify into sectors of growing global importance.³¹⁹

First, like many other (European) countries, the Netherlands are struggling with the challenge to valorise the excellent knowledge it is producing. The indicators in the Innovation Union Scoreboard point at the contrast between the quality of the research system, resulting in relatively many (top) publications and doctorate graduates, versus a modest performance on the account of economic output. A common explanation is found in the business expenditures on R&D, which lags behind EU averages. In comparison, Dutch firms are less inclined to invest heavily in formal R&D. The necessity to improve the role of firms in diffusing and applying public knowledge is one of the drivers behind the Enterprise Policy.

Another urgent challenge is the need to improve availability of funding for innovation. In current times, firms experience difficulties with obtaining access to finance. Venture capital investments might be above the European average, but especially for small firms it remains difficult to fund their innovative activities. As for this specific group, the AWTI expressed his concerns regarding the accessibility of existing policy instruments.

With respect to various actors making up the Dutch innovation system, there is a risk that (small) firms are overwhelmed by the multitude of institutes that are of potential interest. The AWTI is concerned that a lack of clarity in the innovation system prevents fruitful interactions to emerge. Moreover, coordinating a large number of institutions brings costly governance structures. A particular issue which is currently at stake, is the question how to proceed with the six large technological institutes for applied research (TNO, DLO, NLR, ECN, Deltares and Marin). From a market failure perspective, especially the possible competition with private parties deserves attention. Furthermore, with the introduction of the Top Sectors, the position of these institutes has to be reconsidered in order to improve the effectiveness and efficiency of the innovation system as a whole.³²⁰ In order to be more efficient, the Minister of EA asked TNO and the applied research centers, together referred to as "TO2", to develop their strategic agendas together. Apart from being linked to the TKI's, the institutes within TO2 should also be aligned to each other.

Apart from spurring economic progress, policy makers also face the objective to address societal challenges. On its own, the government cannot solve problems in domains like health or sustainability. Therefore, it sees it as its responsibility to support other parts of the innovation system in achieving innovative solutions. How this support can best be organized remains a puzzle. Various institutes and councils have called for societal challenges to be taken on board. Such critiques have recently been expressed by notably the Scientific Council for Government Policy (WRR) and the AWTI. At least in the context of R&I policies organized per Top Sector, the cross-sectoral nature of many societal challenges might be hard to address.

³¹⁹ OECD (September 2014) - [Reviews of Innovation Policy: Netherlands 2014](#). See especially table on p. 25.

³²⁰ OECD (September 2014) - [Reviews of Innovation Policy: Netherlands 2014](#).

Finally, the presence of good education is essential for the future success of an innovation system. The Innovation Union Scoreboard 2015 indicator for Dutch population aged 30-34 with a tertiary education shows a strong performance in comparison to the EU average, but the main concern on this account is the level of education. Due to the crisis, the government planned substantial budget cuts for educational institutions, which were only partially adopted in the end. Nevertheless, the common fear is that the search for more efficiency will go at the cost of quality. Additionally, it has been stated that excellent talent is not exploited adequately: educational institutions are urged to find methods for better challenging excellent students. A last challenge in the domain of education is found in the lack of science and engineering students. The previously weak attractiveness of beta-studies now appears to be improving slowly.

Table 11: Structural challenges and current status of policy solutions

Challenges	Policy measures/actions addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
1. Better utilisation of the public knowledge infrastructure by firms	Knowledge transfer elements within Enterprise Policy	Top Sectors and TKI's are designed for improving valorisation. Bottom-up approach ensures involvement of businesses.
2. Improve availability of funding (esp. for SMEs)	Modification of existing and introduction of new funding measures. Removing administrative barriers.	Policy development addresses both the lack of funding and poor accessibility. Transparency and access for SMEs improved by merger of relevant agencies, simplification of policies, and creation of National Funding Guide.
3. Reorganization of institutes for applied research (technological and scientific).	Five action points, formulated in 'Vision on applied research' (July 2013)	TO2 federation now operational. Evaluation in 2016.
4. How to deal with (cross-sectoral) societal challenges?	Challenges are put on the agendas of Top Sectors, ambition to create linkages between them, and participation in Horizon2020.	No indications for efficiency or effectiveness yet, but strong uptake of social challenges in research agendas (e.g. in Innovation Contracts, NWO program, Green Deals / Health Deals, Smart City-initiatives)
5. Quality improvement of the overall higher education system	Science vision 2025 (nov. 2014). National Research Agenda (nov. 2015).	Comments by stakeholders are mixed.

6.2 Meeting structural challenges

As the Ministries of EA and ECS develop their policies by organizing social debates and by consulting stakeholders, they are open to solutions for addressing structural challenges. In fact, the Top Sector policy is characterized by an unprecedented tendency to continuously experiment in public-private settings. This marks a significant change from the policy style in which one single strategy formed the basis for a static policy mix. The current approach builds on several cornerstones as well, but these allow for adaptations in the design.

Gradually, most of the structural challenges have been targeted with adapted or new policies. Table 11 in the previous section, summarizes the current status of those actions. We describe these policy measures in more detail below.

The necessity to improve the role of firms in diffusing and applying public knowledge is one of the drivers behind the R&I strategy of the Ministries of Economic Affairs and Education, Culture and Science: the Enterprise Policy. An essential element is that research is conducted through public-private partnerships. Besides supporting regular research projects of the TKIs, the government provides a top-up for research-oriented PPP-initiatives. As part of the new R&I policy, the government is reorganizing its applied research institutes to reduce governance costs and reduce complexity for SMEs. In 2014 industry invested 359mln in research conducted in TKIs, which amounts to 44% of total funding for TKI-projects. Taken together with the public funding, the total TKI R&D-expenditures were €814mln. This is above the target of €800mln, out of which 40% funded by private parties. The bottom up, firm focused, approach taken in the design of the Top Sectors and their research agendas (notably the bi-annual Knowledge and Innovation Contracts) ensures involvement of businesses and the direction of policy support at the challenges and opportunities observed by these firms. A greater involvement of SMEs in the instruments of the top sector policy could increase the impact of this policy further. In order to make this happen, policy measures were simplified and a special intervention for SME participation was introduced (SME Innovation support for Top Sectors; MIT) over the past few years. A detailed discussion of knowledge transfer activities is provided in section 5.7.

Recognizing that especially small firms face problems with acquiring capital, there are several (non-fiscal) policies exclusively devoted to facilitate private R&D spending by SMEs. These include the SME Innovation support Top Sectors (MIT) and the Future Funds, which covers Innovation Credits (also available to larger businesses), SEED capital and Fund-of-Funds, SME loan guarantee scheme (BMKB), Innovation Performance Contracts (IPC), micro-financing, and the Growth facility scheme. Innovative public procurement from SMEs is actively promoted through, for instance, the SBIR. The Netherland Investment Agency (NIA) is a funds set up by the government to mobilize institutional investors. Other measures include a programme that offers SMEs support in acquiring bank credit (MKB-Go), an action plan to increase the equity capital of SMEs and an increase in the ceiling of the micro-financing facility (Qredits; now continuing without public funding). The government partially finances platforms for crowdfunding. Actual use of the various instruments is supported with efforts to lower administrative barriers. A striking example in this respect is the merger of Syntens and the Chambers of Commerce as of January 2014. This should make it easier for SMEs to find their way to support, just like the recent launch of a National Funding Guide. Additional policy efforts partially focus on attracting foreign startup to set up shop in The Netherlands for which among others a startup visa was implemented. According to an evaluation of enterprise policy in 2014, a growing number of SMEs receive funding for innovation projects through measures such as the MIT. In total, 65% of public R&D

budgets was used by SMEs in 2014.³²¹ It is too early to evaluate the full effect of the new enterprise policy in this respect, as the planned evaluation is postponed to 2016.

In order to clarify and improve the role of public institutes of applied research, the Ministry of EA published a vision report in July 2013.³²² The report contains five action points: elaboration of the relation with private parties; focus on multi-annual research collaboration within Top Sectors; a shift from block funding to competitive funding; more focus on quality and impact; uniform governance structures. Several of these actions have already been initiated, since parts of the Top Sector policy have been developed in further detail after the report was published. Also the decreasing share of block-funding has already been budgeted. In 2014 the TO2 federation published her integrated strategic agenda for 2015-2018, and this intensified collaboration is expected to continue in a similar approach for the period 2018-2022.³²³ According to the EA's budget plans, the TO2-institutes will be evaluated again in 2016. It is also foreseen that the TO2-institutes continue their efforts to adapt their research program to the strategic agendas of the Topconsortia for Knowledge and Innovation (TKIs) and further research demands from the Topsectors. In May 2015, an information event was organized to initiate interactions on this account.³²⁴

As for the societal challenges, the ministries of Economic Affairs and Education, Culture and Science released a brochure, named 'Global Challenges, Dutch Solutions', in which they clarify the link between societal problems and the Top Sector Policy.³²⁵ This link is twofold: the ministries state that the R&D&I they are supporting will generate innovations with relevance for societal problems; and secondly, they stress that by making participation in the Horizon2020 program part of the Top Sector policy, also Europe's Grand Challenges have become part of Dutch R&D&I dynamics. In June 2015, the Ministry of EA also released a midterm report concerning the 'Green Growth' activities she is undertaking as of 2013.³²⁶ Societal challenges keep showing up as a central theme in research policies, especially when it comes to the topic of circular economy. Furthermore, now that also the Creative Industry and Logistics embedded societal challenges in their innovation contracts (2016-2017), all of the Topsectors have formulated a way to direct NWO research funding to socially responsible innovation.³²⁷ Furthermore, given the success of the Green Deal program in which public and private parties commit themselves to tackling sustainability issues, the government recently launched a Health Deal program as well.³²⁸

The structural challenge with respect to education has received ample attention in the past few years. In particular the strategic agenda on Higher education, research and science ('Quality in Diversity') from 2011 and the more recent Science Vision 2025 (November 2014) and Strategic Agenda on Higher Education and Research 2015-2025 (July 2015) mark important steps towards improvements on this account. The national technology pact 2020 (signed in 2013 and monitored annually) forms a non-binding broad agreement between industry, trade unions, educational institutions and governments at various levels to spur technology and technological education. Together with the human capital agendas of the top sectors, it is intended to address the shortage of skilled workers. Co-ordination in the Human Capital Agendas of the Top Sectors and the Technology Pact could help improve responsiveness to labor market demand.

³²¹ Ministry of Economic Affairs (October 2015). [Progress Report Enterprise Policy 2015](#). In Dutch.

³²² <https://www.rijksoverheid.nl/documenten/kamerstukken/2013/07/05/aanbiedingsbrief-visie-op-het-toegepaste-onderzoek>

³²³ 'Ministry of Economic Affairs (November 2014). [Progress in implementing the Vision on Applied Research](#)'

³²⁴ Ministry of Economic Affairs (October 2015). [Progress Report Enterprise Policy 2015](#). In Dutch.

³²⁵ Ministries of Economic Affairs and Education Culture & Science (January 2014) [Global Challenges Dutch Solutions](#).

³²⁶ Ministry of Economic Affairs (June 2015). [Midterm review Green Growth](#) 2015. In Dutch.

³²⁷ NWO (October 2015). [Socially responsible innovation in all Topsectors from 2016 onwards](#). In Dutch.

³²⁸ Ministry of Health, Wellbeing and Sport (October 2015). [Minister Schippers about to support innovative Dutch health care \(inter\)nationally](#). In Dutch.

With respect to good education it is worthwhile to note that from September 1st 2015, the basic grant for students in higher education was replaced by a loan option. The supplementary grant and public transport card continue to exist. The Dutch government invests the money from the basis grant directly into the enhancement of the quality of education. Examples of investments include intensive support for students; increase of contact hours; rewards for good scientist who also teach. Students, universities and colleges are given a major say in the destination of the money for higher education. Nevertheless, it should be noted that the transformations in the higher education system (especially the introduction of performance agreements in 2012), and the tendency to allocate money to research rather than education (e.g. due to a lack of career opportunities for good educators), remain issues of fierce debates. This can be observed in the protests of spring 2015, as well as in a range of consultations and visions reflecting on the proposed approaches like (for instance) the Strategic Agenda Higher Education and Research 2015-2025.^{329,330}

³²⁹ Education Council of the Netherlands (October 2015). [Advice Strategic Agenda Higher Education and Research 2015-2025](#). In Dutch.

³³⁰ Rathenau Institute (October 2015). [Choices regarding the future of Dutch science](#). In Dutch.

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Abbreviations

AOW	General Old-Age Pensions Act
AWT(I)	Advisory Council of Science, Technology (and Innovation) Policy
BERD	Business Expenditures for Research and Development
BvGD	Proof of Good Service
CBS	Statistics Netherlands (Centraal Bureau voor de Statistiek)
CPB	Bureau of Economic Policy Analysis
DLO	Agricultural Research Institutes (WUR)
EB	Centre of Policy Statistics
ECN	Energy Research Centre Netherlands
EL&I	Ministry of Economic Affairs, Agriculture and Innovation
ERA	European Research Area
ERDF	European Regional Development Fund
ESF	European Social Fund
EU	European Union
EU28	European Union including 28 Member States
EA	Ministry of Economic Affairs
ECS	Ministry of Education, Culture and Science
FES	Economic Structure Enhancement Fund
FTE	Full Time Equivalent
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GO	Business Loan guarantee scheme
GOVERD	Government Intramural Expenditure on R&D
HE	Higher Education
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector
HTSM	High Tech Systems and Materials
ICT	Information and Communication Technology
IPC	Innovation Performance Contracts
IU	Innovation Union
IUS	Innovation Union Scoreboard
KNAW	Royal Netherlands Academy of Arts and Sciences
LCV	National Commission of Valorisation
LTI	Large Technology Institute

MARIN	Maritime Research Institute Netherlands
MIT	SME innovation support for Top Sectors
NII	Dutch Investment Agency
NL	The Netherlands
NLR	Aerospace Knowledge Enterprise
NSFC	National Science Foundation of China
NWO	Netherlands Organisation for Scientific Research
OECD	Organisation for Economic Co-operation and Development
PBL	Netherlands Environmental Assessment Agency
PMO	Company and Public Organisations
PPS	Purchasing Power Standards
PRO	Public Research Organisations
R&D	Research and Development
R&I	Research and Innovation
RCI	Regional Competitiveness Index
RDA	Research & Development Allowance
RVO	Netherlands Enterprise Agency (formerly NL Agency)
SBIR	Small Business Innovation Research Programme
SCP	Netherlands Institute of Social Research
SER	Social and Economic Council of the Netherlands
SME	Small and Medium Sized Enterprise
STW	Research Council for Technical Sciences
TKIs	Top consortia for Knowledge and Innovation
TNO	Netherlands Organisation for Applied Scientific Research
TTI	Technologische Topinstituten
UMC	University Medical Center
VSNU	Association of Universities
VVD	People's Party for Freedom and Democracy
WBSO	Research and Development (R&D) tax credit
WRR	The Advisory Council on Governance Policy
WUR Wageningen	Wageningen University and Research Centre (collaboration between University and DLO)

List of Figures

Figure 1: Structure of the national research and innovation system and its governance	19
Figure 2: Government deficit and public debt.....	37
Figure 3: Funding of the total GERD	38
Figure 4: R&D appropriations and government funded GERD in millions of national currency	39
Figure 5: Government intramural expenditure by sectors of performance.....	40
Figure 6: evolution of foregone tax revenues due to R&D tax credits (WBSO + RDA only).....	41
Figure 7: gives an idea of the evolution of the relative size direct and indirect R&D support by the Dutch government.	42
Figure 8: Fiscal consolidation and R&D.....	42
Figure 9: Total Yearly governmental procurement expenditures.....	52
Figure 10: BERD intensity broken down by most important macro sectors (C= manufacture, G_N=services).	58
Figure 11: BERD by source of funds	59
Figure 12: top sectors in manufacturing R&D data (C26=manufacture of computer, electronic and optical products; C20= Manufacture of chemicals and chemical products; C28=manufacture of machinery and equipment n.e.c).	60
Figure 13: R&D expenditures in top service sectors (J=information and communication, G=wholesale and retail trade; repair of motor vehicles and motorcycles, M=professional, scientific and technical activities).	61
Figure 14: economic sectors as percentage of the total GVA.	62
Figure 15: GVA in manufacturing.	62
Figure 16: value added (GVA and at factor cost) for the leading (in terms of BERD) manufacture and service sectors (millions)	64
Figure 17: BES-funded public R&D in The Netherlands as % of GERD (in €MLN) and % of GDP	82
Figure 18: BES-funded public R&D as % of GERD and as % of GDP in 2011 in Member States	83
Figure 19: Structural Funds for core R&D activities 2000-2006, 2007-2013 and 2014-2020. We use the categories: 182 (2000-2006), 03 and 04 (2007-2013) and 062 (2014-2020) as proxies for KT activities.	83
Figure 20: CIS survey 2012 – share of enterprises cooperating with academia	85
Figure 21: Public-private co-publications by field 2003-2013 in THE NETHERLANDS. Scopus database.....	87

List of Tables

Table 1: Main R&I indicators 2012-2014.....	13
Table 2: Basic indicators for R&D investments.....	36
Table 3: Key Dutch Public R&D Indicators.....	37
Table 4: Public Funding from Abroad to Dutch R&D (in millions of national currency) ..	39
Table 5: Estimation of public funding flows (Sources: NRP, 2015; TWIN 2013-2019). .	45
Table 6: Total intramural R&D expenditure (business enterprise sector) by source of funds in millions €. [Eurostat: rd_e_gerdfund; last accessed on 04-04-2016]	46
Table 7: R&D expenditure, and share of project funding. 2015 figures. (Rathenau: TWIN 2013-2019)	50
Table 8: Estimated direct and indirect public budgets for R&D&I, 2014-2020 (in €mln and as a % of GDP). Source: TWIN 2014-2020.	57
Table 9: Main indicators for quality of the Dutch science base.....	67
Table 10: Key indicators on Doing Business 2015 index for the Netherlands (WorldBank, 2015).....	76
Table 11: Structural challenges and current status of policy solutions.....	96

Annex 1 – List of the main research performers

Top R&D performers	Private sector ³³¹	Public (universities) ³³²	Public (other) 328
1	ASML	Utrecht University	TNO
2	Philips	University of Amsterdam	ECN
3	Royal DSM	Free University	Deltares
4	NXP Semiconductors	Leiden University	Stichting FOM
5	Thales Nederland B.V.	Erasmus University	NLR
6	DAF Trucks N.V.	University of Groningen	KNMI
7	VDL Groep	Radboud University	MESA+
8	Synthon	Wageningen University	MARIN
9	Rijk Zwaan	University of Maastricht	J.M. Burgerscentrum
10	Bayer CropScience Vegetale Seeds	Technical University of Delft	TI Food and Nutrition

³³¹ Technisch weekblad (2014). R&D top-30 2015.

³³² www.wti2.nl

Annex 2 – List of the main funding programmes

NAME	Timeline	Budget71 (2015, €mln)	Target group*
Fund of Funds	2012-...	32	Enterprises
Early phase funding	2014-...	13	Startups
BMKB	1915-...	71	SMEs
Growth funding facility	2006-...	9	SMEs
Garantie Ondernemingsfinanciering (GO)	2009-...	12	Enterprises
Business Angel Progr. (TechnoPartner)	2005-...	0	Startups
Dutch Good Growth Fund	2014-2017	150	Enterprises
Entrepreneurship support (Technology pact, Ambitious entrepreneurship, etc.)	...-...	25	SMEs
MIT	2013-...	46	SMEs
Regional development companies (ROMs)	...-...	42	Enterprises
Innovation credits	2008-...	76	SMEs
Risk capital	-	19	Enterprises
Innovation-targeted research programs (IOPs)	1980-...	7	PPS, SMEs
Innovation Performance Contracts (IPC)	2007-2013; 2015-...	2	SMEs
TKI-allowance	2013-...	51	PPS
TTI's/TKI's	1996-...	113	PPS
STW	1981-...	4	PPS
WBSO	1994-...	794	Enterprises
RDA	2012-...	238	Enterprises

Innovationbox	2007-...	± 1000 (est.)	Enterprises
Eurostars	2008-...	11	PPS, SMEs
JTI/Eureka (Innovating internationally)	1985-...	14	PPS

* PPS = public private partnerships in which also research institutes can participate

Annex 3 – Evaluations, consultations, foresight exercises

Evaluations

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